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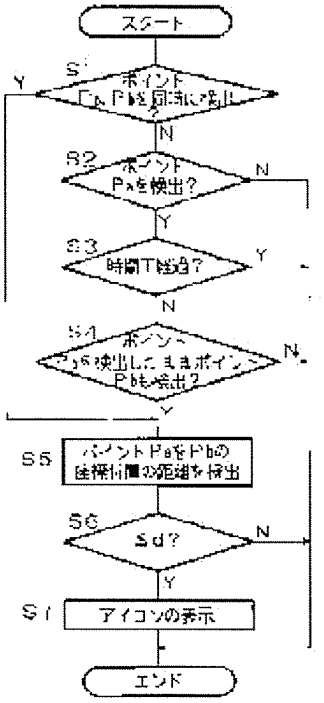
(54) INFORMATION INPUT-OUTPUT SYSTEM, PROGRAM AND STORAGE MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To improve operability by operating an icon on an image screen just at hand.
SOLUTION: A coordinate input device is arranged on the image screen of a display device being a plasma display for detecting coordinates of a position of indicating a surface of the image screen by a finger. Only when the coordinate input device detects the fact of simultaneously indicating two points of the image screen by finger (Y of Step S1, Y of S2, and Y of S4), the icon preregistered in a prescribed table is displayed in the vicinity of an indicated position (Step S7).



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It has the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the information input/output system which displays said display based on the coordinate detected with said coordinate input unit When it detects pointing to two or more locations in said screen top with the storage which registers the actuation image beforehand, and said coordinate input unit Information input/output system characterized by having an actuation image display means to display the actuation image registered into said storage on the predetermined location on said screen.
[Claim 2] the time check which clocks the time amount of a between the time of pointing to said two or more locations, respectively -- a means and the 1st comparison means which judges whether it is below the predetermined time to which this clocked time amount is set beforehand -- having -- said actuation image-display means -- said time check -- the information input/output system according to claim 1 characterized by what said actuation image is displayed for on condition that time amount is below said predetermined time.
[Claim 3] Said actuation image-display means is information input/output system according to claim 1 or 2 with which it is characterized by what it has a ranging means calculate the distance between the coordinates which pointed to said two or more locations, respectively, and the 2nd comparison means which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image is displayed for on condition that said operation distance is below said predetermined distance.
[Claim 4] It is information input/output system given in one 1 of claims 1-3 which said storage is registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates, and are characterized by what said actuation image display means displays said actuation image for according to the contents of registration of said storage.
[Claim 5] It is the information input/output system according to claim 4 characterized by having an updating means to update the contents of registration of said storage from the contents of a reception beam concerned when the reception injury of this input is carried out, a reception means to receive the input of the contents of registration to said storage, and.
[Claim 6] It is the information input/output system according to claim 1 characterized by to have an actuation means receive and perform predetermined actuation according to detection distance and a direction concerned when there is said detection by said migration detection means, where a migration detection means point and detect the distance and the direction of migration of a location and said actuation image on said screen are displayed.
[Claim 7] Said actuation image display means is information input/output system according to claim 6 characterized by what is been what changes the display position on said screen of said actuation image according to detection distance and a direction concerned when there is detection by said migration detection means, where said actuation image is displayed.

[Claim 8] It is the information input/output system according to claim 1 characterized by to have an enlarging-or-contracting means responds in detection distance and a direction concerned, and expand or reduce the magnitude on said screen of said actuation image when there is said detection by a migration detection means point and detect the distance and the direction of migration of a location and said migration detection means on said screen.
[Claim 9] When it detects pointing to two or more locations in said screen top with said coordinate input unit A door display means to display a door on the predetermined location on said screen, and a migration detection means to point on said screen and to detect the distance and the direction of migration of a location, Where said door is displayed, when there is detection of said migration It has a door modification means to change the display position on said screen of said door according to detection distance and a direction concerned. Said actuation image display means Information input/output system according to claim 1 which is what displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.
[Claim 10] Said actuation image is information input/output system given in one 1 of claims 1-9 characterized by what is been an icon, a dial, a slider bar, or a pallet.
[Claim 11] It is information input/output system given in one 1 of claims 1-10 to which said storage has registered two or more kinds of said actuation images, and said actuation image-display means is indicated said actuation image by said thing [carrying out by choosing more than one from the actuation images of a class], corresponding [of said location to which it pointed / concerned] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.
[Claim 12] It has the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the program to the computer which makes a computer perform controlling information input/output system which displays said display based on the coordinate detected with said coordinate input unit which can be read It is the program characterized by making a computer perform actuation image display processing which displays the actuation image beforehand registered into storage on the predetermined location on said screen when it detects pointing to two or more locations in said screen top with said coordinate input unit.
[Claim 13] the time check which clocks the time amount of a between the time of pointing to said two or more locations, respectively -- processing and the 1st comparison processing which judges whether it is below the predetermined time to which this clocked time amount is set beforehand perform to a computer -- making -- said actuation image-display processing -- said time check -- the program according to claim 12 characterized by what said actuation image displays for on condition that time amount is below said predetermined time.
[Claim 14] Said actuation image-display processing is the program according to claim 12 or 13 to which it is characterized by what make a computer perform the ranging processing which calculates the distance between the coordinates which pointed to said two or more locations, respectively, and the 2nd comparison processing which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image displays for on condition that said operation distance is below said predetermined distance.
[Claim 15] Said actuation image display processing is a program given in one 1 of claims 12-14 characterized by what said actuation image is displayed for according to the contents of registration of said storage registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates.
[Claim 16] It is the program according to claim 15 characterized by making a computer perform the update process which updates the contents of registration of said storage from the contents of a reception beam concerned when the reception injury of this input is carried out with the reception processing which receives the input of the contents of registration to said storage.
[Claim 17] It is the program according to claim 12 which carries out [making a computer perform the

actuation processing which receives and performs predetermined actuation according to detection distance and a direction concerned, when there is said detection by said migration detection means, where said actuation image is displayed as migration detection processing in_which point on said screen and the distance and the direction of migration of a location are detected, and] as the description.
[Claim 18] Said actuation image display processing is a program according to claim 17 characterized by what is been what changes the display position on said screen of said actuation image according to detection distance and a direction concerned when there is detection by said migration detection means, where said actuation image is displayed.
[Claim 19] It is the program according to claim 12 which carries out [making a computer perform the enlarging-or-contracting processing which responds in detection distance and a direction concerned, and expands or reduces the magnitude on said screen of said actuation image when there is said detection by the migration detection processing in_which point and the distance and the direction of migration of a location are detected and said migration detection processing on said screen, and] as the description.
[Claim 20] When it detects pointing to two or more locations in said screen top with said coordinate input unit Door display processing which displays a door on the predetermined location on said screen, and migration detection processing in which point on said screen and the distance and the direction of migration of a location are detected, Where said door is displayed, when there is detection of said migration A computer is made to perform door modification processing in which the display position on said screen of said door is changed according to detection distance and a direction concerned. Said actuation image display processing The program according to claim 12 which is what displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.
[Claim 21] Said actuation image display processing is a program given in one 1 of claims 12-20 characterized by what an icon, a dial, a slider bar, or a pallet is displayed for as said actuation image.
[Claim 22] Said actuation image display processing is a program given in one 1 of claims 12-21 characterized by choosing the display of said actuation image from the actuation images registered into said storage two or more kinds, and performing it, corresponding [of said location to which it pointed / concerned] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.
[Claim 23] The storage characterized by having memorized the program of a publication to one 1 of claims 12-22.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to information input/output system and a program.
[0002]
[Description of the Prior Art] It has the indicating equipment for displaying an alphabetic character and an image in recent years, the coordinate input unit which arranged the information input screen (touch panel side) in the front face of an indicating equipment, and the control unit which performs the display control of an indicating equipment based on the input from a coordinate input unit, and the information input/output system which constituted the screen and the write-in field of an electronic blackboard using the indicating equipment and the coordinate input unit is offered.
[0003] for example, made in Smart Technologies (SMART Technologies Inc.) is smart -- 2000 is in the condition which projected the image of an alphabetic character, a picture, a graphic form, and a graphic on the panel using the liquid crystal projector connected to the computer, and performs processing which downloads the information on handwritten to a computer using the coordinate input unit (write-in field) arranged in the front face of the plane of projection (screen) of a panel. And handwritten information and image information are compounded within a computer, and it enables it to express as real time through a liquid crystal projector again.
[0004] Since the image inputted using the coordinate input unit can be displayed in piles as an overwrite image to the image on the screen currently displayed with the display, at a meeting, a presentation, schools, etc., it is already used widely, and the use effectiveness is highly estimated by such information input/output system. Moreover, it is used also as a teleconference by including communication facility, such as voice and an image, in such information input/output system, and connecting between remote places by the communication line.
[0005] Moreover, the technique of various methods is proposed as a coordinate input unit used for such information input/output system. That is, the optical thing besides [which has a physical field like a touch panel side as this coordinate input device] a method is proposed (for example, refer to JP,11-110116,A).
[0006]
[Problem(s) to be Solved by the Invention] By the way, when operating various applications etc. on that screen using the above information input/output system, it is possible to carry out by displaying a tool bar on a screen, and carrying out by pointing to the icon on this tool bar by directions members, such as a finger and a pen, or operating remote control of dedication. When pointing to an icon by the directions member, a coordinate input unit detects the coordinate of the location to which the directions member concerned points, and it judges to which icon it is pointing.
[0007] The display used with information input/output system However, 40 inches, If the thing of the big screen of 50 inches is assumed and it is going to point to the icon of the tool bar on a screen (usually displayed on the upper and lower sides of a screen, or an edge on either side) by the directions member Compromise to the location where the desired icon is displayed, or [lengthening the limbs greatly one

by one, in order that a user may operate an icon] Or it is necessary to start specially, whenever it clicks on an icon, in sitting on a chair and operating it, and there is fault that actuation is very complicated.
[0008] Moreover, in operating [since it cannot be operated on the screen of information input/output system when operating it with remote control of dedication as mentioned above, while looking at a screen, or] it, explaining, there is fault that actuation is very complicated too.
[0009] The purpose of this invention is making it possible to operate an icon on a screen at hand immediately, and raising operability.
[0010] Another purpose of this invention is enabling it for the actuation performed by pointing to one on a screen to distinguish easily, when raising this operability.
[0011] Another purpose of this invention is enabling it to distinguish easily the case where it points to two or more [on a screen], without aiming at the display of an icon, when raising the aforementioned operability.
[0012] Another purpose of this invention is enabling it to display an icon in the class, number, or display position which is registered beforehand in the aforementioned case.
[0013] Another purpose of this invention is raising operability further, as a user's can register with a request about the detail of the icon which is displayed in the aforementioned case.
[0014] Another purpose of this invention is that point on a screen and a user enables it to perform predetermined actuation by migration of a location.
[0015] Another purpose of this invention is enabling it to display that it pointed on the screen and the actuation image was operated according to migration of a location.
[0016] Another purpose of this invention is making an actuation image easy to expand, to reduce to desired size easily, and to operate it.
[0017] Another purpose of this invention is displaying various kinds of actuation images alternatively by the difference in how on a screen pointing.
[0018]
[Means for Solving the Problem] Invention according to claim 1 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the information input/output system which displays said display based on the coordinate detected with said coordinate input unit When it detects pointing to two or more locations in said screen top with the storage which registers the actuation image beforehand, and said coordinate input unit It is the information input/output system characterized by having an actuation image display means to display the actuation image registered into the predetermined location on said screen.
[0019] In this specification, it is the graphic form displayed on a screen, and by performing predetermined actuation with a finger etc. to that graphic form, an actuation image receives that a user performs various actuation to information input/output system, and are an icon, a dial, a slider bar, a pallet, etc.
[0020] Therefore, by easy actuation which points to two or more [on a screen] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.
[0021] the time check which clocks the time amount of a between the time of invention according to claim 2 pointing to said two or more locations in invention according to claim 1, respectively -- a means and the 1st comparison means which judges whether it is below the predetermined time to which this clocked time amount is set beforehand -- having -- said actuation image-display means -- said time check -- it is characterized by what said actuation image displays for on condition that time amount is below said predetermined time.
[0022] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.

[0023] A ranging means by which invention according to claim 3 calculates the distance between the coordinates which pointed to said two or more locations, respectively in invention according to claim 1 or 2, It has the 2nd comparison means which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display means is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.
[0024] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.
[0025] Invention according to claim 4 is set to invention given in one 1 of claims 1-3. Said storage It is registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates. Said actuation image display means is characterized by what said actuation image is displayed for according to the contents of registration of said storage.
[0026] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.
[0027] In invention according to claim 4, invention according to claim 5 is characterized by having an updating means to update the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out, a reception means to receive the input of the contents of registration to said storage, and.
[0028] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.
[0029] Invention according to claim 6 carries out having an actuation means receive and perform predetermined actuation according to detection distance and a direction concerned as the description in invention according to claim 1, when there is said detection by said migration detection means, where a migration detection means point and detect the distance and the direction of migration of a location and said actuation image on said screen are displayed.
[0030] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.
[0031] In invention according to claim 6, invention according to claim 7 is characterized by what the display position on said screen of said actuation image is changed for according to detection distance and a direction concerned, when said actuation image display means has detection by said migration detection means, where said actuation image is displayed.
[0032] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.
[0033] Invention according to claim 8 is characterized by to have an enlarging-or-contracting means responds in detection distance and a direction concerned, and expand or reduce the magnitude on said screen of said actuation image in invention according to claim 1, when there is said detection by a migration detection means point and detect the distance and the direction of migration of a location and said migration detection means on said screen.
[0034] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.
[0035] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 1, invention according to claim 9 A door display means to display a door on the predetermined location on said screen, and a migration detection means to point on said screen and to detect the distance and the direction of migration of a location, Where said door is displayed, when there is detection of said migration Having a door modification means to change the display position on said screen of said door according to detection distance and a direction concerned, said actuation image display means displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.
[0036] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an

actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.
[0037] Invention according to claim 10 is characterized by what said actuation image is an icon, a dial, a slider bar, or a pallet in invention given in one 1 of claims 1-9.
[0038] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.
[0039] Invention according to claim 11 is set to invention given in one 1 of claims 1-10. Said storage Having registered two or more kinds of said actuation images, said actuation image display means is indicated said actuation image by said thing [carrying out by choosing more than one from the actuation images of a class], corresponding [of said location to which it pointed / concerned] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.
[0040] Therefore, various kinds of actuation images can be alternatively displayed by the difference in how on a screen to point.
[0041] Invention according to claim 12 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the program to the computer which makes a computer perform controlling information input/output system which displays said display based on the coordinate detected with said coordinate input unit which can be read When it detects pointing to two or more locations in said screen top with said coordinate input unit, it is the program characterized by making a computer perform actuation image display processing which displays the actuation image beforehand registered into storage on the predetermined location on said screen.
[0042] Therefore, by easy actuation which points to two or more [on a screen] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.
[0043] the time check which clocks the time amount of a between the time of invention according to claim 13 pointing to said two or more locations in invention according to claim 12, respectively -- with processing 1st comparison processing which judges whether it is below the predetermined time to which this clocked time amount is set beforehand is performed to a computer -- making -- said actuation image display processing -- said time check -- it is characterized by what said actuation image is displayed for on condition that time amount is said below predetermined time.
[0044] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.
[0045] Invention according to claim 14 is set to invention according to claim 12 or 13. The ranging processing which calculates the distance between the coordinates which pointed to said two or more locations, respectively, A computer is made to perform 2nd comparison processing which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display processing is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.
[0046] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.
[0047] Invention according to claim 15 is set to invention given in one 1 of claims 12-14. Said actuation image display processing It is characterized by what said actuation image is displayed [among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates] for according to the contents of registration of said storage registered about said class at least.
[0048] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.

[0049] In invention according to claim 15, invention according to claim 16 is characterized by making a computer perform the update process which updates the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out with the reception processing which receives the input of the contents of registration to said storage.
[0050] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.
[0051] Invention according to claim 17 makes a computer perform migration detection processing of pointing on said screen and detecting the distance and the direction of migration of a location in invention according to claim 12, and actuation image-display processing carries out what it is what changes the display position on said screen of said actuation image according to detection distance and a direction concerned as the description, when this detection is in the condition that said actuation image was displayed.
[0052] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.
[0053] In invention according to claim 17, invention according to claim 18 is characterized by making a computer perform actuation processing which receives and performs predetermined actuation according to detection distance and a direction concerned, when there is said detection by said migration detection means, where said actuation image is displayed.
[0054] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.
[0055] It carries out that invention according to claim 19 makes a computer perform the enlarging-or-contracting processing which responds in detection distance and a direction concerned, and expands or reduces in the magnitude on said screen of said actuation image when there is said detection by the migration detection processing in_which point and the distance and the direction of migration of a location are detected and said migration detection processing on said screen, in invention according to claim 12 as the description.
[0056] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.
[0057] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 12, invention according to claim 20 Door display processing which displays a door on the predetermined location on said screen, and migration detection processing in which point on said screen and the distance and the direction of migration of a location are detected, Where said door is displayed, when there is detection of said migration A computer is made to perform door modification processing in which the display position on said screen of said door is changed according to detection distance and a direction concerned. Said actuation image display processing It is displayed that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.
[0058] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.
[0059] Invention according to claim 21 is characterized by what said actuation image display processing displays an icon, a dial, a slider bar, or a pallet for as said actuation image in invention given in one 1 of claims 12-20.
[0060] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.
[0061] It is characterized by carrying out by invention according to claim 22 choosing in invention given in one 1 of claims 12-21 from the actuation images with which two or more kinds of said actuation image display processings are registered into said storage in the display of said actuation image, corresponding [of said location to which it pointed / concerned] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.
[0062] Therefore, various kinds of actuation images can be alternatively displayed by the difference in

how on a screen to point.
[0063] Invention according to claim 23 is a storage characterized by having memorized the program of a publication to one 1 of claims 12-22.
[0064] Therefore, the same operation as invention of a publication and effectiveness can be done so to one 1 of claims 12-22.
[0065]
[Embodiment of the Invention] The gestalt of 1 implementation of this invention is explained.
[0066] Drawing 1 is the appearance perspective view showing roughly the information input/output system 1 which is the gestalt of this operation, and drawing 2 is the block diagram showing electric connection of the information input/output system 1. As shown in drawing 1 and drawing 2 , the information input/output system 1 is equipped with the panel section 4 which is the I/O device which consists of the plasma display panels (PDP) 2 and the coordinate input units 3 which are an indicating equipment, the computers 5, such as a personal computer, the scanner 6 for reading the image of a manuscript, the printer 7 that outputs image data to the detail paper, and the device stowage 9 which contains a video player 8.
[0067] PDP2 is a thing big screen type [, such as 40 inches available as an electronic blackboard and 50 etc. inches,], and CRT, LCD, etc. may be used for it as long as it is this big screen type of display. Moreover, although illustration is omitted, the video input terminal and the loudspeaker are formed in PDP2, and a video player 8 is begun, in addition various information machines and equipment and AV equipments, such as a laser disk player, a DVD player, and a video camera, are connected, and it has composition which can use PDP2 as a big screen monitor.
[0068] As shown in drawing 2 , the information input/output system 1 is a configuration which connects PDP2, a scanner 6, a printer 7, and a video player 8 to a computer 5, respectively, and controls the whole system by the computer 5. Moreover, the controller 10 for coordinate input unit 3 which performs the operation of the position coordinate in information input area 3a directed by predetermined bodies, such as directions members, such as a pen, and a fingertip, etc. is connected to the computer 5, and the coordinate input unit 3 is also connected to the computer 5 through this controller 10. Moreover, it is also possible to transmit the data which could connect the information input/output system 1 to the network 11 through the computer 5, and displayed the data created by other computers connected on the network 11 on PDP2, or were created with the information input/output system 1 to other computers.
[0069] Next, a computer 5 is explained. Here, drawing 3 is the block diagram showing the electrical installation of each part built in a computer 5. As shown in drawing 3 , CPU12 by which a computer 5 controls the whole system, and RAM14 used as a work area of ROM13 and CPU12 which recorded the bootstrap etc. are connected through the bus 21. Moreover, the keyboard 15 for inputting an alphabetic character, a numeric value, various directions, etc. into a bus 21 through a predetermined interface, The mouse 16 for performing migration, a range selection, etc. of cursor, and the hard disk 17 which is a store, With the graphics board 18 which is connected to PDP2 and controls the display of the image to the PDP2 The interface (I/F) 20 for the network card (or modem) 19 for connecting with a network 11 being connected, and connecting controller 10, scanner 6, and printer 7 grade is also connected.
[0070] Various application program 24 grades, such as the device driver 23 for operating the coordinate input device 3 on a computer 5 through an operating system (OS) 22 and a controller 10, and drawing software word processor software, spreadsheet software presentation software calibration software, are stored in the hard disk 17.
[0071] moreover, the record medium 26 (a flexible disk --) which recorded various kinds of program codes (control program) of OS22, a device driver 23, or various application program 24 grades on the computer 5 A hard disk, an optical disk (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), The program reader 25 (it responds to the recording method of a record medium 26) which is equipment which reads the program code currently recorded for the ability using various kinds of media, such as a magneto-optic disk (MO) and a memory card equipments, such as flexible disk drive equipment, CD-ROM drive equipment, and MO drive equipment, -- it can use -- it is carried.
[0072] The various application programs 24 are executed by CPU12 under control by OS22 started

according to the injection of the power source to a computer 5. For example, when drawing software is started by predetermined actuation of a keyboard 15 and a mouse 16, the predetermined image based on drawing software is displayed on PDP2 through a graphics board 18. Moreover, a device driver 23 is also started with OS22, and will be in the condition in which the data input from the coordinate input device 3 through a controller 10 is possible. Thus, where drawing software is started, when a user traced and draws an alphabetic character, a graphic form, etc. on information input area 3a of the coordinate input unit 3 by directions members, such as a finger, Rhine to which the migration locus of a directions member is connected to the image on the screen where the coordinate information on the migration locus of the directions member is inputted into a computer 5 as image data, for example, is displayed on PDP2 is displayed in piles as an overwrite image. Or the image of the field to which the migration locus of a directions member is connected conversely is eliminated. And he is trying for the location on screen 2a of PDP2 which displays this image in piles or eliminates an image to lap with the location which the user traced and drew by directions members, such as a finger, by information input area 3a.

[0073] If the case where a line and an alphabetic character are overwritten is explained more to a detail at an example, CPU12 of a computer 5 writes the drawing information for drawing a line and an alphabetic character based on the inputted image data in the video memory (not shown) which generates and is prepared for a graphics board 18 according to the position coordinate based on the inputted coordinate information. Then, when a graphics board 18 transmits to PDP2 by making into a picture signal drawing information written in video memory, the same alphabetic character as the alphabetic character written by the user will be displayed on PDP2. That is, since the computer 5 recognizes the coordinate input device 3 as a pointing device like a mouse 16, by computer 5, the same processing as the case where an alphabetic character is written using a mouse 16 on drawing software will be performed.

[0074] Next, the coordinate input unit 3 is explained to a detail. In addition, as a coordinate input unit 3 which can be applied to the information input/output system 1 of the gestalt of this operation, the thing of the various methods with which detection methods differ can be considered. For example, a touch panel can be mentioned as a coordinate input device 3 which detects mechanically and electrically the coordinate location to which a directions member points on screen 2a of PDP2 (information input area 3a).

[0075] However, below, five things (1st coordinate input unit 3A- 5th coordinate input unit 3E) from which a detection method differs are mentioned about the coordinate input unit 3 which detects optically the coordinate location to which a directions member points as a more suitable example on screen 2a of PDP2 (information input area 3a), and the configuration and principle are explained.

[0076] A. Explain the 1st coordinate input unit **** and 1st coordinate input unit 3A based on drawing 4 - drawing 8 . The so-called recursive light electric shielding method is used for this 1st coordinate input unit 3A.

[0077] Here, drawing 4 is the explanatory view showing roughly the configuration of 1st coordinate input unit 3A. As shown in drawing 4 , coordinate input unit 3A is equipped with information input area 3a of the shape of an oblong square in the size corresponding to the size of screen 2a of PDP2. This information input area 3a is a field which enables the input of an alphabetic character, a graphic form, etc. by tracing with a finger etc. Near the corner located in the lower part both ends of this information input area 3a, the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R) which performs luminescence and light-receiving is formed by whenever [predetermined champing-angle]. From these optical units 27, by the shape of a sector which consists of a flat surface or a bundle of light (probe light) almost of nothing, for example, L1, L2, L3, ..., Ln (R1, R2, R3, ..., Rn), for a flat surface, the thin film-like flux of light film is floodlighted in parallel along the front face of screen 2a of PDP2 so that it may spread throughout information input area 3a.

[0078] Moreover, the recurrence reflective member 28 is formed in the periphery except the lower part of information input area 3a of the coordinate input unit 3. This recurrence reflective member 28 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on

whenever [that incident angle]. For example, it will be reflected by the recurrence reflective member 28 and the probe light L3 floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light L3' which follows the same optical path again. That is, information input area 3a is formed also of the recurrence reflective member 28.

[0079] Next, the optical unit 27 is explained. Here, drawing 5 is the block diagram showing the structure of the optical unit 27 roughly. In addition, although drawing 5 shows the subject the direction of x-z, it is drawing which looked at the component same about the part shown with a two-dot chain line from another (the direction of x-y, or the direction of y-z).

[0080] As shown in drawing 5 , the optical unit 27 is equipped with the floodlighting means 29 and the light-receiving means 30. The floodlighting means 29 is equipped with the light sources 31, such as possible LD (LaserDiode) of extracting a spot to some extent, and Pinpoint LED (Light Emitting Diode). The light perpendicularly irradiated from this light source 31 to screen 2a of PDP2 is collimated in the x directions by the cylindrical lens 32 which can change only the scale factor of an one direction. The light collimated by the cylindrical lens 32 in the x directions is condensed to the direction of y by the cylindrical lenses 33 and 34 of two sheets the cylindrical lenses and distribution of curvature cross at right angles in a cylindrical lens 32. That is, the field which condensed the light from the light source 31 to the line will be formed behind a cylindrical lens 34 of an operation of these cylindrical-lens groups (cylindrical lenses 32, 33, and 34). The slit plate 35 which has a narrow slit long and slender in x directions in the direction of y is arranged here. Therefore, the light which passed the cylindrical-lens group (cylindrical lenses 32, 33, and 34) forms the linear secondary light source 36 in the slit location of the slit plate 35. The light emitted from the secondary light source 36 is turned up by the half mirror 37, it is the parallel light which met the front face of screen 2a, without spreading in the perpendicular direction of screen 2a of PDP2, and as in parallel as screen 2a, serves as flux of light film of the shape of a sector centering on the secondary light source 36, and advances information input area 3a. If it puts in another way, sector-like light will form information input area 3a. Condensing optical system is formed with these cylindrical-lens groups (cylindrical lenses 32, 33, and 34) and slit plates 35.

[0081] As mentioned above, it will be recursively reflected by the recurrence reflective member 28, and the flux of light film which became sector-like and ran information input area 3a will follow the same optical path again, and will return to a half mirror 37. Therefore, the flux of light film recursively reflected by the recurrence reflective member 28 also forms information input area 3a.

[0082] The retroreflection light which was reflected by the recurrence reflective member 28 and returned to the half mirror 37 penetrates a half mirror 37, and it carries out incidence to the light-receiving means 30. After retroreflection light which carried out incidence to the light-receiving means 30 is made into a line through the cylindrical lens 38 which is a condenser lens, it is received in a location which is different for every probe light in CCD39 prepared at intervals of distance f (f is the focal distance of a cylindrical lens 38) from this cylindrical lens 38. In addition, CCD39 of the gestalt of this operation is 1-dimensional CCD, and the number of pixels is made into 2,048 pixels.

[0083] In the direction of the z-axis, the retroreflection light reflected in the detail by the recurrence reflective member 28 does not receive an operation of a cylindrical lens 38, but while it had been collimated by it, it reaches CCD39. Moreover, image formation of the retroreflection light is carried out on CCD39 which spread so that it might condense at the core of a cylindrical lens 38 with screen 2a of PDP2, if parallel, consequently was installed in the focal plane of a cylindrical lens 38 in response to the operation of a cylindrical lens 38. Thereby, according to the existence of retroreflection light, distribution of optical reinforcement is formed on CCD39. That is, when retroreflection light is interrupted by the directions member P, the point (peak point mentioned later) that optical reinforcement is weak will arise in the location equivalent to the retroreflection light by which it was interrupted on CCD39. CCD39 which received retroreflection light generates the electrical signal based on the optical intensity distribution of retroreflection light (probe light), and outputs it to the controller 10 mentioned above. In addition, as shown in drawing 5 , both the secondary light source 36 and the cylindrical lens 38 are arranged in the location of distance d to a half mirror 37, and are in physical relationship [****].

[0084] Here, drawing 6 is the block block diagram of the controller 10 which performs processing which specifies the coordinate of the location where the light which the electrical signal based on the optical intensity distribution of retroreflection light is inputted from a photo detector 39, and advances information input area 3a was interrupted. This controller 10 calculates luminescence control of the light source (LD) 31 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R), and the output from CCD39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). As shown in drawing 6 , the bus connection of the interface 43, A/D converter 44, and the LD driver 45 for connecting with ROM41 which CPU40 which controls each part intensively is formed in the controller 10, and records a program and data on this CPU40, RAM42 which stores various data, enabling free rewriting and functions as a work area, and a computer 5 is carried out. Moreover, the bus connection of EEPROM47 which is the memory of a hard disk 46 or a non-volatile which stores various kinds of program codes (control program) is carried out to CPU40. The microcomputer is constituted by CPU40, ROM41, and RAM42 here. The program readers 48, such as flexible disk drive equipment which is equipment which reads the program code currently recorded on the record medium 49 which recorded various kinds of program codes (control program), i.e., a flexible disk, a hard disk, optical disks (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), the magneto-optic disk (MO), the memory card, etc., CD-ROM drive equipment, and MO drive equipment, are connected to such a microcomputer.

[0085] As a circuit which calculates the output from CCD39, the analog processing circuit 51 is connected to the output terminal of CCD39, as shown in drawing. Within CCD39, the reflected light which carried out incidence to CCD39 is changed into the image data of an analog with the electrical-potential-difference value according to luminous intensity, and is outputted as an analog signal. After this analog signal is processed in the analog processing circuit 51, it is changed into a digital signal by A/D converter 44, and is passed to CPU40. Then, the operation of the 2-dimensional coordinate of the directions member P is performed by CPU40.

[0086] Various kinds of program codes (control program) recorded on various kinds of program codes (control program) or record media 49 which were stored in the hard disk 46 will be written in RAM42 according to the injection of the power source to a controller 10, and various kinds of program codes (control program) will be performed.

[0087] Then, the function performed by CPU40 based on a control program is explained. Here, the coordinate detection processing which is the features-function with which the coordinate input unit 3 of the gestalt of this operation is equipped is explained concretely below.

[0088] Here, drawing 7 is the front view showing an example which pointed by the directions member P to one in information input area 3a of the coordinate input unit 3. When the n-th probe light Ln is interrupted by the directions member P in the light of the shape of a sector which consists of probe light called L1, L2, L3, ..., Ln which were irradiated from left-hand side optical unit 27L as shown in drawing 7 for example, the probe light Ln does not reach the recurrence reflective member 28.

[0089] At this time, the optical intensity distribution on CCD39 are considered. Here, drawing 8 is the explanatory view showing detection actuation of CCD39 typically. Although the optical intensity distribution on CCD39 are almost fixed if the directions member P is not inserted into information input area 3a Since the probe light Ln is not received by CCD39 of the optical unit 27 when the directions member P is inserted into information input area 3a and the probe light Ln is interrupted by the directions member P, as shown in drawing 8 , The position Xn on CCD39 of the optical unit 27 corresponding to the probe light Ln serves as a field (scotoma) where optical reinforcement is weak. Since the location Xn which is the field (scotoma) where this optical reinforcement is weak will appear in the wave of the optical reinforcement outputted from CCD39 as a peak point, CPU40 recognizes the appearance of the peak point in the wave of such optical reinforcement by change of an electrical potential difference, and it detects the location Xn of the scotoma used as the wave-like peak point of this optical reinforcement.

[0090] Moreover, detection of the scotoma location Xn used as the wave-like peak point of optical reinforcement detects the distance from the scotoma location Xn to the main pixel of CCD39 based on

the pixel number (for example, setting to drawing 8 the pixel number m) of CCD39.
[0091] The location Xn (the CCD39 top of left-hand side optical unit 27L the XnL and CCD39 top of right-hand side optical unit 27R XnR) which is the field (scotoma) where optical reinforcement is weak corresponds with the outgoing radiation / incident angle thetan of the interrupted probe light, and can know thetan by detecting Xn. That is, when distance from the scotoma location Xn to the main pixel of CCD39 is set to a, thetan is a function of a. thetan=tan -1 (a/f) ..... (1)
It can express. However, f is the focal distance of a cylindrical lens 38. thetan in left-hand side optical unit 27L is replaced with thetanL here, and a is replaced with XnL.
[0092] Furthermore, it is thetaL=g (thetanL) as a function of XnL asked for include-angle thetaL of the directions member P and left-hand side optical unit 27L to make by (1) formula in drawing 7 with the transform coefficient g of the geometric relative-position relation between left-hand side optical unit 27L and information input area 3a. ..... (2)
However, it can express thetanL=tan -1 (XnL/f).
[0093] Similarly, the notation L in above-mentioned (1) (2) type is transposed to Notation R also about right-hand side optical unit 27R, and it is thetaR=h (thetanR) by the transform coefficient h of the geometric relative-position relation between right-hand side optical unit 27R and information input area 3a. ..... (3)
However, it can express thetanR=tan -1 (XnR/f).
[0094] If [here] w which shows the distance of the center position of CCD39 of left-hand side optical unit 27L, and the center position of CCD39 of right-hand side optical unit 27R to drawing 7 , the two-dimensional coordinate (x y) of the point directed by the directions member P in information input area 3a is the principle of triangulation. X=w-tanthetaR/(tanthetaL+tanthetaR) ..... (4)
Y=w-tanthetaL-tanthetaR/(tanthetaL+tanthetaR) .... (5)
It is computable by carrying out.
[0095] These (1), (2), (3), (4), and (5) types are beforehand stored in the hard disk 46 or the record medium 49 as a part of control program, and the position coordinate (x y) of the directions member P is computed by (1), (2), (3), (4), and (5) type as a function of XnL and XnR. That is, the position coordinate (x y) of the directions member P will be computed by detecting the location of the scotoma on CCD39 of left-hand side optical unit 27L, and the location of the scotoma on CCD39 of right-hand side optical unit 27R.
[0096] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.
[0097] And according to such coordinate input unit 3A, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.
[0098] B. Explain the 2nd coordinate input unit, next coordinate input unit of ** 2nd 3B based on drawing 9 - drawing 11 . In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.
[0099] This 2nd coordinate input unit 3B is the so-called coordinate input unit of a recursive light reflex method.
[0100] Here, drawing 9 is the perspective view showing the directions member 61 used for coordinate input unit 3B. Moreover, drawing 10 is the front view showing an example which pointed by the directions member 61 to one in information input area 3a of coordinate input unit 3B. The recurrence reflective member 62 is formed near the tip of the directions member 61 used in order to point to one in information input area 3a of coordinate input unit 3B, as shown in drawing 9 . This recurrence reflective member 62 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on whenever [that incident angle]. For example, it will be reflected by the recurrence reflective member 62 and the probe light Ln floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light Ln' which follows the same optical path again, as shown in drawing 10 . Therefore, as shown in drawing 10 , in coordinate input unit 3B, it is not necessary to form the recurrence reflective member 28 in information input area 3a like coordinate

input unit 3A mentioned above. In addition, the directions member 61 is carrying out the pen-like configuration, and its quality of the materials, such as rubber and plastics, are more desirable than glossy metal.

[0101] Therefore, it inserts in the suitable location (x y) of information input area 3a of coordinate input unit 3B near [equipped with the recurrence reflective member 62 of such a directions member 61] the tip. For example, when the probe light Ln in the flux of light film of the shape of a sector floodlighted from left-hand side optical unit 27L is reflected by the recurrence reflective member 62 of the directions member 61, the retroreflection light Ln' is received by CCD39 of left-hand side optical unit 27L. Thus, when CCD39 receives retroreflection light Ln', the position Dn on CCD39 corresponding to retroreflection light Ln' serves as a field (bright point) where optical reinforcement is strong. That is, as shown in drawing 11 , on CCD39, the field where optical reinforcement is strong is generated in the location of a location Dn, and a peak appears in the configuration of the luminous-intensity distribution from CCD39. The location Dn where this peak appears corresponds with the outgoing radiation / incident angle thetan of the reflected probe light, and can know thetan by detecting Dn. That is, the position coordinate (x y) of the directions member 61 will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A of a recursive light electric shielding method which mentioned above also in coordinate input unit 3B of such a recursive light reflex method.

[0102] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0103] And according to such coordinate input unit 3B, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing. In addition, not using the above directions members 61, a finger etc. can also be used as a directions member.

[0104] C. Explain the 3rd coordinate input unit, next 3rd coordinate input unit 3C based on drawing 12 - drawing 14 . In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.

[0105] This 3rd coordinate input unit 3C is the modification of the optical unit in 1st coordinate input unit 3A. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 1st coordinate input unit 3A and the information input area was formed in it, in coordinate input unit 3C, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used.

[0106] Here, drawing 12 is the top view showing the optical unit 70 roughly. As shown in drawing 12 , it has floodlighting means 70a which consists of LD (Laser Diode)71, the half mirror 72 and the polygon mirror 73 which are the light source which the optical unit 70 has a drive circuit (not shown), and carries out outgoing radiation of the laser beam, and a condenser lens 74, and a photo detector 75. The photo detector 75 consists of PDs (Photo Diode) prepared from the condenser lens 74 at intervals of distance f (f is the focal distance of a condenser lens 74). Such an optical unit 70 carries out sequential reflection at a radial by the polygon mirror 73 in which a rotation drive is carried out by the pulse motor (not shown) by predetermined angular-velocity omegat, after turning up the laser beam which carried out outgoing radiation from LD71 by the half mirror 72. Therefore, the optical unit 70 will repeat and floodlight beam light to a radial. That is, information input area 3a will be formed of the beam light floodlighted by the radial from two optical units 70. It is reflected by the polygon mirror 73 and the beam light which it was reflected and carried out incidence to the optical unit 70 on the other hand reaches a half mirror 72. The reflective beam light which reached the half mirror 72 penetrates a half mirror 72, reaches a photo detector 75, and is changed into an electrical signal.

[0107] Next, coordinate input unit 3C which replaced with and applied such an optical unit 70 to the optical unit 27 used by 1st coordinate input unit 3A is explained. If the beam light by which the directions member P is inserted in a certain location in information input area 3a is covered as shown in drawing 13 , since it is not reflected by the recurrence reflective member 28, the beam light will not reach a photo detector 75. Thus, when the beam light by which the directions member P is inserted in a

certain location in information input area 3a is covered, a DIP appears in the configuration of the luminous-intensity distribution from a photo detector 75.
[0108] Although optical reinforcement shows "I=I1" when the directions member P is not inserted in information input area 3a as it is shown in drawing 14 , although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, "I=I0" will be shown, when the directions member P is inserted in information input area 3a and recursive light does not return to a photo detector 75. Thus, the part whose optical reinforcement is "I=I0" is a DIP. In addition, among drawing 14 , time amount t=t0 is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.
[0109] Therefore, in the time amount t from which optical reinforcement became "I=I0", if it is t1, the outgoing radiation include angle theta of the beam light covered by the directions member P inserted in information input area 3a is computed as theta=omega (t1-t0) = omega**t. That is, the outgoing radiation include angle theta (thetanL, thetanR) of the beam light covered by the directions member P inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member P by the technique of triangulation based on those outgoing radiation include angles theta (thetanL, thetanR) will be computed.
[0110] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.
[0111] And according to such coordinate input unit 3C, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.
[0112] D. Explain the 4th coordinate input unit, next 4th coordinate input unit 3D based on drawing 15 - drawing 16 . In addition, about the same part as the part explained by 2nd coordinate input unit 3B and 3rd coordinate input unit 3C, explanation is also omitted using the same sign.
[0113] This 4th coordinate input unit 3D is the modification of the optical unit in 2nd coordinate input unit 3B. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 2nd coordinate input unit 3B and the information input area was formed in it, in 4th coordinate input unit 3D, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used. In addition, since 3rd coordinate input unit 3C explained, the explanation about the optical unit 70 is omitted here.
[0114] Coordinate input unit 3D which replaced with and applied such an optical unit 70 to the optical unit 27 used by 2nd coordinate input unit 3B is explained. As shown in drawing 15 , when the directions member 61 is inserted in a certain location in information input area 3a, retroreflection of the predetermined beam light is carried out in the recurrence reflective member 62 of the directions member 61, and the beam light reaches a photo detector 75. Thus, when retroreflection of the beam light by which the directions member 61 is inserted in a certain location in information input area 3a is carried out, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 75.
[0115] Although optical reinforcement shows "I=I0" when the directions member 61 is not inserted in information input area 3a as it is shown in drawing 16 , although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, "I=I1" will be shown, when the directions member 61 is inserted in information input area 3a and recursive light reaches a photo detector 75. Thus, the part whose optical reinforcement is "I=I1" is a peak. In addition, among drawing 16 , time amount t=t0 is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.
[0116] Therefore, in the time amount t from which optical reinforcement became "I=I1", if it is t1, the outgoing radiation include angle theta of the beam light in which retroreflection was carried out by the directions member 61 inserted in the information input area 63 is computed as theta=omega (t1-t0) = omega**t. That is, the outgoing radiation include angle theta (thetanL, thetanR) of the beam light in

which retroreflection was carried out by the directions member 61 inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member 61 by the technique of triangulation based on those outgoing radiation include angles theta (thetanL, thetanR) will be computed.

[0117] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0118] And according to such coordinate input unit 3D, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0119] E. Explain the 5th coordinate input unit, next coordinate input unit of ** 5th 3E based on drawing 17 - drawing 18 . This 5th coordinate input unit 3E is the so-called coordinate input unit of the camera image pick-up method which incorporates the image information in an information input area with an image pick-up camera, and detects a position coordinate based on the part of that incorporated image information.

[0120] Here, drawing 17 is the front view showing roughly the configuration of 5th coordinate input unit 3E. The image pick-up camera 82 which is an image pick-up means separates distance w in the upper part both ends of information input area 3a in 5th coordinate input unit 3E, and is formed in them. The photo detector 83 and the image formation optical lens 84 which are CCD (Charge Coupled Device) separate distance f to the image pick-up camera 82, and are prepared in it. The image pick-up field angle of these image pick-up cameras 82 is about 90 degrees, and it is installed, respectively so that information input area 3a may be made into photographic coverage. Moreover, the image pick-up camera 82 is installed so that it may become a predetermined distance from screen 2a of PDP2 which forms a coordinate input screen, and the optical axis is parallel to screen 2a of PDP2.

[0121] In addition, it is the periphery section except the upper part of information input area 3a, and the whole photography visual field is prepared in the background plate 85 in the wrap location, without barring the image pick-up field angle of the image pick-up camera 82. This background plate 85 turns that field in the center of information input area 3a, and is formed in an abbreviation perpendicular to screen 2a of PDP2. Let this background plate 85 be uniform black, for example.

[0122] The signal of the image pick-up camera 82 and relation with the directions member P are shown in drawing 18 . As shown in drawing 18 , when the directions member P is inserted in information input area 3a, the directions member P is photoed by the image pick-up camera 82, and the image of the directions member P is formed on the photo detector 83 of the image pick-up camera 82. In the background plate 85 is black like 5th coordinate input unit 3E and using a finger as a directions member P, since the directions member P will have a high reflection factor compared with the background plate 85, the part equivalent to the directions member P of a photo detector 83 serves as a field (bright point) where optical reinforcement is strong.

[0123] Since it is technically well-known about the electrical installation of each part, detailed explanation is omitted, but as shown in drawing 18 , when the directions member P is inserted in information input area 3a, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 83. The location Dn where this peak appears supports include-angle thetan of the appearance of the directions member P from the principal point of the image formation optical lens 84, and thetan can express it as thetan=arctan (Dn/f) as a function of Dn. That is, the position coordinate (x y) of the directions member P will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A which mentioned above also in 5th coordinate input unit 3E of such a camera image pick-up method.

[0124] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0125] In addition, as a directions member P, the exclusive pen with a light emitting device with which self emits light is applicable.

[0126] And according to such 5th coordinate input unit 3E, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0127] Then, the explanation is omitted about the processing currently performed by the conventional

information input/output system among the processings in the drawing software which is one of the various application programs 24 performed in the information input/output system 1 of the gestalt of this operation, and the same processing, and the function relevant to the features-function with which the information input/output system 1 is equipped is explained below.
[0128] As shown in drawing 19 , in drawing software, the tool bars 91 and 92 which enable actuation of the various functions by the user are displayed. And if it points to the location where the icon 93 contained in these tool bars 91 and 92 is displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of that location and it will click on an icon 93, various actuation is attained.
[0129] Screen 2a is a big screen, such as 40 inches or 50 inches. However, moreover, the tool bars 91 and 92 Since it displays on the upper and lower sides of screen 2a, or an edge on either side, usually, User M Compromise to the location where the desired icon 93 is displayed, or [lengthening the limbs greatly one by one, in order to click on an icon 93] Or it is necessary to start specially, whenever it clicks on an icon 93, in sitting on a chair and operating it, and actuation is complicated.
[0130] So, in drawing software, various kinds of processings in which it explains below are performed, and operability is raised. That is, drawing software displays various actuation images on screen 2a corresponding to a user performing various actuation on screen 2a with a finger etc.
[0131] Here, an actuation image is a graphic form displayed on a screen, and when a user performs predetermined actuation with a finger etc. to that graphic form, it receives that a user performs various actuation (various actuation concerning drawing software at this example) to the information input/output system 1.
[0132] That is, a user detects the difference in the actuation performed on screen 2a using a finger etc., displays a different actuation image for the actuation of every on screen 2a, and receives various actuation from a user through the displayed actuation image.
[0133] Drawing 20 is an explained flow chart which takes lessons from this processing one example. As shown in drawing 20 , when the coordinate input unit 3 detects having pointed to 2 on screen 2a, and Points Pa and Pb (referring to drawing 21) to coincidence with the finger etc. (Y of step S1), Or the coordinate input unit 3 detects having pointed to 1 on screen 2a, and Point Pa (Y of step S2). With the condition of having pointed within fixed time amount T set up beforehand after this detection to (N of step S3), and Point Pa (referring to drawing 21), When the coordinate input unit 3 detects what coincidence pointed to other points Pb (refer to drawing 21), (Y of step S4), The distance of the coordinate location of the Point Pa and Point Pb which were detected is computed (step S5). When the distance is below the distance d set up beforehand, (Y of step S6), The icon 94 (refer to drawing 22) as an example of the actuation image contained in the drawing software beforehand stored in the hard disk 1 among the various icons 93 currently used with this drawing software is displayed on the predetermined field to which it is beforehand set up near the point Pb (step S7). Step S7 has realized an actuation image display means and actuation image display processing. step S3 -- a time check -- a means and a time check -- processing, the 1st comparison means, and 1st comparison processing are realized. Step S5 realizes a ranging means and ranging processing, and step S6 has realized the 2nd comparison means and 2nd comparison processing.
[0134] The example of drawing 22 shows the example which displays three, Rhine tool icon 94a, eraser icon 94b, and stamp icon 94c, on coincidence as an icon 94. If it points to the location where the icon 94 is displayed like the icon 94 if these icons 94 are displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of the location and it will click on an icon 94, various actuation is attained.
[0135] for example, the icon of the function in which Rhine tool icon 94a is the icon of the function which draws Rhine on screen 2a, and eraser icon 94b eliminates the image on screen 2a in the example of an icon 94 shown in drawing 22 -- it is -- stamp icon 94c -- "secrecy" -- it is the icon of the function which displays which "secret" alphabetic character and "secret" mark on screen 2a. If it explains more concretely, by clicking Rhine tool icon 94a, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the finger etc., and Rhine can be displayed on the locus. Moreover, by clicking eraser icon 94b, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the

finger etc., and the image on the locus can be eliminated. furthermore, the location directed with the finger on screen 2a etc. by clicking stamp icon 94c -- "secrecy" -- which "secret" alphabetic character and "secret" mark can be displayed.

[0136] Thus, since the predetermined icon 94 can be displayed on the location where it is beforehand set up near the point Pb by pointing to two points and Points Pa and Pb to coincidence with a finger etc. Compromise to the location where the desired icon 94 is displayed, or [lengthening the limbs greatly one by one, in order that User M may click on an icon 94] or -- starting specially, whenever it clicks on an icon 94, in sitting on a chair and operating it **** -- etc. -- even if it does not perform troublesome actuation, an icon 94 can be displayed at hand and operability can be improved.

[0137] In order to display an icon 94, only when it points to two points of screen 2a to coincidence with a finger etc., (Y of step S1, Y of S2, Y of S4), The case where the locus traced with the finger etc. by the function of Rhine tool icon 94a is indicated by Rhine since an icon 94 is displayed (step S7), It is easily distinguished from the case where it points to one on screen 2a, like [in the case of eliminating the image on the locus traced with the finger etc. by the function of eraser icon 94b].

[0138] Moreover, if a certain amount of time amount is vacated and it is made to point to two on screen 2a, since an icon 94 is displayed, the case where place the extent time difference which is the purpose of an except, and it points to two points is distinguishable, since it is necessary to point to two points and Points Pa and Pb within fixed time amount T at coincidence (N of step S3).

[0139] Furthermore, if distance d is set as the distance usually considered that it may point with two fingers of one hand, since an icon 94 is displayed, the case where keep the extent distance which is the purpose of an except and it points to two points is distinguishable, since an icon 94 is not displayed unless the distance during Points Pa and Pb is below the distance d (Y of step S6).

[0140] In addition, the class of icon displayed as an icon 94 and a number, a display position (the exception of the location on the basis of any of Points Pa and Pb, Point Pa or the distance from Pb, a direction, range), etc. can be beforehand set up on the actuation screen displayed on screen 2a. This realizes a reception means and reception processing. And if this setup is made, the contents of the aforementioned predetermined table will be updated in the class of icon 94 after a setup and a number, and a display position, and an icon 94 will be henceforth displayed according to those contents. This realizes an updating means and an update process.

[0141] In this case, these items can also be registered into a table for every user according to individual. And discernment of each user can be performed using various authentication techniques. For example, or it inputs a user's name and ID on screen 2a (or it chooses), it is reading a user's fingerprint and collating this with a registered fingerprint beforehand etc. (for details, see a JP,2000-187419,A official report, the JP,2000-187420,A official report, etc., for example). Furthermore, when Points Pa and Pb are in the upper limit side on screen 2a, an icon 94 is displayed on the bottom, when it is in a lower limit side at the bottom, and when Points Pa and Pb are in the right end side on screen 2a, an icon 94 can be displayed on left-hand side on right-hand side, when it is in a left end side.

[0142] When it points to three or more on screen 2a, you may make it display an icon 94, although he is trying to display an icon 94 in the aforementioned example when it points to two points of Points Pa and Pb on screen 2a. In this case, you may make it change the class of icon 94 to display by to what point it pointed. By this, when it points to two points for example, on screen 2a, the highest icon 94 of operating frequency is displayed for a user. it is alike, and since it follows, the thing whose it increases with three points and four points and for which the icon 94 with low operating frequency is displayed one by one becomes possible, the class of icon 94 which carries out a finger and comes out of and which can be displayed is increased and the display can be changed easily, operability can be raised further.

[0143] By the way, in order to perform such processing, it is necessary to enable it to detect to coincidence the coordinate of two points (points Pa and Pb) to which it pointed on screen 2a. Then, the technique for detecting the coordinate of Points Pa and Pb to coincidence is also explained using the coordinate input unit 3 mentioned above.

[0144] That is, when coordinate input unit 3A of a recursive light electric shielding method was explained to the example and the directions members A and B are inserted into information input area 3a

at coincidence as shown in drawing 23 , the field (scotoma) where the optical reinforcement of two places is weak is because it is generated, respectively on CCD (photo detector)39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). that is, since the position coordinate was computed as a function of XnLXnR as mentioned above, when two directions members A and B are inserted into information input area 3a at coincidence While the include angle thetaR2 of an include angle thetaR1, and the directions member B and right-hand side optical unit 27R of the directions member A and right-hand side optical unit 27R to make to make is computed The include angle thetaL2 of an include angle thetaL1, and the directions member B and left-hand side optical unit 27L of the directions member A and left-hand side optical unit 27L to make to make will be computed, and a total of four position coordinates will be computed.

[0145] However, even if it is the case where a total of four position coordinates are computed by two directions members in this way by the inside of information input area 3a having been directed to coincidence, it is possible to detect the position coordinate directed by two directions members. Real-image judging processing in which the position coordinate of the actual covering point (reflective spot) by two or more directions members is judged out of two or more position coordinates computed below is explained.

[0146] The flow chart which shows roughly the flow of the processing in which drawing 24 includes real-image judging processing here, and drawing 25 are the explanatory views showing the condition that two or more position coordinates which can be set to information input unit 3A are computed. In addition, in drawing 21 , the coordinate locus of a real image which directed "A1, A2, A3, A4" by one directions member, and "B1, B-2, B3, B4" show the coordinate locus of the real image directed by the directions member of another side. Moreover, "C1, C2, C3, C4", and "D1, D2, D3, D4" are virtual images.

[0147] In the gestalt of this operation, calculation of a coordinate judges first whether a calculation coordinate is five or more (step S14 shown in drawing 24). Since directions members, such as (Y of step S14 shown in drawing 24), three or more fingers, and a pen, are inserted into information input area 3a at coincidence when a calculation coordinate is five or more, future decision is not performed.

[0148] On the other hand, when a calculation coordinate is not five or more, in continuing step S15, it is judged from the directions member inserted into (N of step S14 shown in drawing 24) information input area 3a being one or two whether the number of calculation coordinates is one.

[0149] For example, since the number of calculation coordinates is not one when two directions members are inserted into information input area 3a at coincidence and four position coordinates (A1, B1, C1, D1 which are shown in drawing 25) are computed (N of step S15), coordinate extract processing in which the position coordinate of the actual covering point by two or more directions members is extracted out of two or more position coordinates is performed. In addition, although not illustrated especially, when 1 receives optical unit 27 when two directions members are inserted into information input area 3a at coincidence and the insertion point is located in a line on a straight line, the number of the position coordinates computed is two.

[0150] As coordinate extract processing, two or more computed position coordinates (A1, B1, C1, D1) are first memorized in the memory of RAM14 grade (step S16).

[0151] In continuing step S17, it is judged whether there is any position coordinate decided as a real image among two or more position coordinates (A1, B1, C1, D1) recorded on memory.

[0152] When there is no position coordinate decided as a real image, it progresses to (N of step S17), and step S18, and it judges whether the calculation coordinate required for a real-image judging for multiple times acquired one by one serially is memorized by memory.

[0153] When the calculation coordinate for multiple times is memorized by memory, after setting up the initial criteria (experimental value) of (Y of step S18) vector length, displacement length, and the displacement direction (step S19), it progresses to step S20 and real-image judging processing is performed.

[0154] Here, drawing 26 is a flow chart which shows the flow of real-image judging processing roughly. As shown in drawing 26 , first, in step S51, real-image judging processing makes a predetermined

calculation coordinate an origin coordinate, computes the coordinate vector value and coordinate vector length between coordinates, and memorizes them in the memory of RAM14 grade for every sampled position coordinate.

[0155] Here, the calculation approach of a coordinate vector value is explained with reference to drawing 27 . In drawing 27 , the position coordinate which was able to acquire the position coordinate detected last time (X1, Y1), and this time is set to (X2, Y2). A coordinate vector value is computed by delta Y/delta X from variation deltaX=X2-X1 of the direction of X coordinate, and variation deltaY=Y2-Y1 of the direction of Y coordinate. From X shaft orientations, the coordinate vector value in this case is evaluated at intervals of 10 degrees by the vector table TB stored in RAM42 shown in drawing 28 , and is beforehand stored in it. In addition, what is necessary is just to set this spacing (10 degrees) as arbitration. Moreover, the approximate value of a calculation result shall be used for a coordinate vector value. For example, it will be set to coordinate vector value =24 if it is the case of delta Y/delta X= 0.900 in -deltaY and -deltaX.

[0156] Moreover, if the coordinate vector value between the coordinates in each sampling is computed as mentioned above as drawing 27 is shown, and the coordinate vector length L between each coordinate is a coordinate (X1, Y1) and the coordinate vector length L1 of a between (X2, Y2), it is L1=root {(Y2-Y1) 2+(X2-X1) 2}.

It is alike and is computed more. Thus, the coordinate vector value and its coordinate vector length are computed for every sampled position coordinate, respectively.

[0157] That is, in step S51, processing formed into a vector coordinate using the vector data by which setting storing is carried out beforehand to a vector table TB about the length which indicates a part for the change to be the direction where it changes between the position coordinates acquired one by one serially is performed.

[0158] Then, it progresses to step S52 and it is judged whether the coordinate vector length which computed at step S51 is unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period (predetermined time interval accompanying a sampling signal). In addition, the coordinate detection period in the gestalt of this operation is set to 20ms. That is, since step S52 cannot be moved in fact when the coordinate vector length which computed at step S51 is longer than the die length detected in a coordinate detection period (20ms), the coordinate locus judges it to be what is unusual coordinate vector length (abnormality vector length), and is not a real-image locus.

[0159] When coordinate vector length is abnormality vector length, (Y of step S52), Progress to step S53 and it is judged whether the number of position coordinates as which the number of the coordinate vector length which judged abnormality vector length was detected was reached. If the detected number of position coordinates is not reached (N of step S53), a terminal position coordinate is changed (step S54), and the coordinate vector value based on the terminal point and coordinate vector length are again computed in step S51.

[0160] That is, processing of steps S51-S52 is repeated until it is judged with coordinate vector length not being abnormality vector length (N of step S52), or until it is judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length (Y of step S53).

[0161] If the case where followed, for example, a position coordinate A1 is made into an origin coordinate is explained The position coordinate computed just behind that as shown in drawing 25 from it being A2, B-2, and C2 and D2 One position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A1 ->A2, A1 ->B-2, A1 ->C2, and A1 ->D2, the coordinate vector value (origin vector value) concerning one, and its coordinate vector length (origin vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.

[0162] In addition, since (Y of step S53) and decision of a real image can be performed when judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length, it progresses to step S21 mentioned later.

[0163] On the other hand, when judged with coordinate vector length not being abnormality vector

length, (N of step S52) and the position coordinate of the terminal point are memorized in the memory of RAM14 grade (step S55), and predetermined initialization (n= 3 (n: count of a coordinate detection period)) is performed (step S56).
[0164] In continuing step S57, the position coordinate of the terminal point of the origin vector memorized in memory in step S55 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected in the n-th coordinate detection period are computed, and it memorizes in the memory of RAM14 grade.
[0165] Then, it progresses to step S58 and the coordinate vector length which computed at step S57 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.
[0166] When judged with coordinate vector length not being abnormality vector length, (N of step S58), It progresses to step S59 and the coordinate locus of A1 ->A2 and the coordinate locus of A2 ->A3 which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).
[0167] Thus, a coordinate vector value being in the specific amount of displacement (V), and judging whether it is the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [coordinate vector length] (L) As shown in drawing 29 , in drawing a straight line generally Although a coordinate vector value changes when drawing a curve, although the coordinate vector length within a coordinate vector value and the same time amount is almost the same and not being illustrated especially, variation is abbreviation identitas and originates in coordinate vector length serving as abbreviation identitas. That is, when a detection object moves onto a straight line or a curve, since it is not generated, the big difference to coordinate vector length and a coordinate vector value is eliminated about the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [coordinate vector length] (L), even if a coordinate vector value is in the specific amount of displacement (V).
[0168] abnormalities -- a variation rate -- the coordinate locus of A1 ->A2 and the coordinate locus of A2 ->A3 which it should progress to (N of step S59), and step S60, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [a coordinate vector value] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.
[0169] Thus, judging whether it is the locus (abnormalities a variation rate direction) on which a coordinate vector value is out of the specific amount of displacement (V), and coordinate vector length is decreasing As shown in drawing 30 , in changing the direction of a straight line a lot and drawing it generally Since the writing speed to turn will carry out sequential reduction, will be in a idle state in the direction commutation point and will begin to be again drawn in the conversion direction at the rate of usual, when a coordinate vector value changes a lot, coordinate vector length originates in increasing toward the conversion direction, after decreasing serially. That is, when a detection object changes a direction a lot, since a idle state of operation occurs just before, even if coordinate vector length is decreasing, it eliminates about the locus (abnormalities a variation rate direction) whose coordinate vector value is outside the specific amount of displacement (V).
[0170] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S60) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate -- the case where it is not a direction, either -- the position coordinate of the terminal point -- the memory of RAM14 grade -- memorizing (step S61) -- the count n of a coordinate detection period -- "1" -- it increments (step S62).
[0171] Then, it is judged whether in step S63, the number of the calculation coordinates for multiple times (judgment coordinate number) which needs the count n of a coordinate detection period for the real-image judging memorized by memory and which is obtained one by one serially was exceeded. When the count n of a coordinate detection period is not over the judgment coordinate number, (Y of step S63) and the continuation vector mentioned above are made into an origin vector (step S64), and in

step S57, the coordinate vector value based on the terminal point and coordinate vector length are computed again.

[0172] That is, a terminal position coordinate is changed (step S66), and processing of steps S57-S64 is repeated until the position coordinate of all terminal points is judged with their being abnormality vector length, abnormality displacement length, or the abnormality displacement direction (Y of step S65).

[0173] and -- the position coordinate of all terminal points -- abnormality vector length or abnormalities -- a variation rate -- merit or abnormalities -- a variation rate -- when judged with it being a direction, (Y of step S65), the coordinate vector value based on [in / progress to step S54 again, change a terminal position coordinate, and / step S51] the terminal point, and coordinate vector length are computed.

[0174] The position coordinate of the terminal point of the origin vector which followed, for example, was memorized in memory in step S55 is A2. When A1 ->A2 shall be a real-image locus, the position coordinate computed just behind that as shown in drawing 25 from it being A3, and B3, C3 and D3 One position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A2 ->A3, A2 ->B3, A2 ->C3, and A2 ->D3, the coordinate vector value (continuation vector value) concerning one, and its coordinate vector length (continuation vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.

[0175] Since it means that (Y of step S63) and a real image were decided on the other hand when judged with the count n of a coordinate detection period having exceeded the judgment coordinate number, the position coordinate will be transmitted to a computer 5 through an interface 43 (step S67), and it will use for processing of the display of the directions location by the directions member, the command input corresponding to a directions location, etc.

[0176] Here, the judgment of being a real image about other position coordinates based on the position coordinate of 1 is explained with reference to drawing 23 . If each A and A' of the judgment of being a real image about other position coordinates based on the position coordinate of 1 shall be a real image in drawing 23 , a coordinate will be detected in the direction of **. For this reason, it turns out that either of A and A' is a real image. Moreover, it turns out similarly that either of B and B' is a real image. That is, only either of the position coordinate which exists in the same direction is a real image, and another side will be a virtual image. Moreover, since B' of the ** direction will also be recognized as a virtual image while A' of another side is recognized as a virtual image when it turns out that one A is a real image, it turns out that B is a real image. That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, it turns out that the judgment of the real image about all position coordinates or a virtual image is possible. Therefore, since it is necessary to perform a real-image judging about no computed position coordinates, it becomes possible to detect the position coordinate at the time of directing two or more places to coincidence by low cost.

[0177] In addition, as shown in drawing 31 , when the position coordinate (it sets to drawing 31 and is B1) of one exists out of information input area 3a among two or more position coordinates (A1, B1, C1, D1) memorized by memory, A1 and C1 can be decided as a real image.

[0178] That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, according to the judgment of the real image about all position coordinates or a virtual image being possible, it will decide as a real image (step S68), and the position coordinate of another side will also be transmitted to a computer 5 through an interface 43 (step S69). Moreover, processing of steps S67-S69 is repeated until it decides about all judgment coordinate numbers (Y of step S70). And when transmission of the position coordinate of the real image about all judgment coordinate numbers is completed, it ends and (Y of step S70) and real-image judging processing return to step S14.

[0179] Next, the processing at the time of being judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length in step S53 is explained. Although it progresses to step S21 as (Y of step S53), and a thing which cannot perform decision of a real image as mentioned above when judged with the coordinate vector length about the position

coordinate of all terminal points being abnormality vector length, in this step S21, it judges whether there is any paddle which is still performing real-image judging processing about the position coordinate (for example, C1 [on drawing 25 and as opposed to A1]) of the same direction. When real-image judging processing about the position coordinate of the same direction has not been performed yet, (N of step S21) and an origin coordinate are changed (step S22), and it progresses to step S20 again, and real-image judging processing is performed. On the other hand, when real-image judging processing about the position coordinate of the same direction is being performed, (Y of step S21) and the criteria of the vector length, displacement length, and the displacement direction set up at step S19 are changed (step S23), it progresses to step S20 again, and real-image judging processing is performed. That is, a real-image judging will be repeated on these conditions by turns about the position coordinate of two points of the same direction.

[0180] Moreover, when the number of the computed position coordinates is one, while transmitting (Y of step S15), and its computed position coordinate to a computer 5 through an interface 43 (step S24), it memorizes in the memory of RAM14 grade (step S25), and returns to step S14.

[0181] Next, in step S17, the case where it is judged with there being a position coordinate decided as a real image is explained. When there is a position coordinate decided as a real image, it progresses to (Y of step S17), and step S26.

[0182] The case where there is a position coordinate decided as a real image here is a case where two or more storage of the position coordinate in case the position coordinate computed as mentioned above is not plurality is carried out at the memory of RAM14 grade, for example, is a case as shown in drawing 32 . As the directions member of 1 has described drawing 32 , it shows the condition that other directions members were inserted into information input area 3a. In addition, the case where there is a position coordinate decided as a real image cannot be overemphasized by including the case where the coordinate of two points is decided by processing which was mentioned above.

[0183] In step S26, based on the last time of the position coordinate decided as a real image, and the value before last, the coordinate vector value (real-image vector value) and coordinate vector length (real-image vector length) between coordinates are computed, and it memorizes in the memory of RAM14 grade.

[0184] then, vector length and a variation rate -- merit and a variation rate -- after setting up the initial criteria (experimental value) of a direction (step S27), the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected by coincidence are computed, and it memorizes in the memory of RAM14 grade. [two or more]

[0185] Then, it progresses to step S29 and the coordinate vector length which computed at step S28 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.

[0186] When judged with coordinate vector length not being abnormality vector length, (N of step S29), It progresses to step S30 and the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).

[0187] abnormalities -- a variation rate -- the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which it should progress to (N of step S30), and step S31, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [a coordinate vector value] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.

[0188] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S31) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate, in not being a direction, either The position coordinate of the terminal point is memorized in the memory of RAM14 grade (step S32). While transmitting the position coordinate to a computer 5 through an interface 43 (step S33), it decides as a real image (step S34), and

the position coordinate of another side is also transmitted to a computer 5 through an interface 43 (step S35).

[0189] the case (Y of step S29) where it is judged with coordinate vector length being abnormality vector length on the other hand -- abnormalities -- a variation rate -- the case (Y of step S30) where it is judged with his being merit -- abnormalities -- a variation rate -- a detection coordinate is changed (step S37) and processing of steps S28-S31 is repeated until it reaches (Y of step S31), and a detection coordinate number (Y of step S36), when judged with it being a direction.

[0190] Therefore, when [for example,] the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is A4, The position coordinate computed just behind that as shown in drawing 32 from their being A, B, C, and D One position coordinate is chosen at a time as a terminal point from these position coordinates (A, B, C, D). Sequential calculation of A4->A, A4->B, A4->C, any of A4->D or the coordinate vector value (locus vector value) concerning one, and its coordinate vector length (locus vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out. That is, other position coordinates located in the same direction to a photo detector in pursuing the locus of the position coordinate of 1 judged that is a real image are recognized to be a virtual image, and the position coordinate which are other real images is decided.

[0191] Moreover, when a detection coordinate number is reached, (Y of step S36) and the criteria of the vector length, displacement length, and the displacement direction set up at step S27 are changed (step S38), and it progresses to step S28 again, and a coordinate vector value (locus vector value) and its coordinate vector length (locus vector length) are computed.

[0192] Even if it is the case where a total of four position coordinates are computed by two directions members by the above processings by the inside of information input area 3a having been directed to coincidence, the position coordinate directed by two directions members can be detected, and these two position coordinates can be confirmed.

[0193] Next, another example of the actuation image displayed on screen 2a is explained.

[0194] First, as shown in drawing 33 , when it points to coincidence to three on screen 2a, the dial 101 which is an actuation image is displayed on the location where it is beforehand set up near [the] the three points (drawing 33 (a)). The image of this dial 101 is beforehand contained in the drawing software of a hard disk 17. And the location of three points which is pointing on screen 2a is moved, if actuation of turning a dial 101 is carried out, the image of a dial 101 can also be rotated and rotation actuation of the dial 101 can be carried out (drawing 33 (b)). This dial 101 is carrying out rotation actuation, and makes it possible to perform predetermined actuation to the information input/output system 1. It is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1 in this example, since an actuation image is a dial, etc.

[0195] Processing about this dial 101 is specifically performed as follows. Drawing 34 is a flow chart explaining the processing in this case. First, it detects that coincidence points to three on screen 2a (Y of step S71). Although the coordinate of three or more points to which it pointed on screen 2a is undetectable to coincidence in the processing explained below with reference to drawing 23 , it cannot be necessary to specify that exact coordinate of three points in this example that what is necessary is just to be able to detect that coincidence points to three on screen 2a. That is, since a total of nine points of the real image of three points and the virtual image of six points are detected also in the example below drawing 23 when pointing to three on screen 2a, thereby, it is detectable that actually pointing is three points (even if the exact location of three points is undetectable).

[0196] In the example of drawing 35 , 6 point G1-G6 of three-point Pa of a real image, Pb and Pc, and a virtual image are detected. And the coordinate of the middle point C of each of these coordinates Pa (xa, ya), Pb (xb, yb), Pc (xc, yc), G1 (x1, y1)-G6 (x6, y6) of nine points is searched for (step S72).

[0197] namely, -- x0= (xa+xb+xc+x1+x2+x3+x4+x5+x6)/9 y0=
(ya+yb+yc+y1+y2+y3+y4+y5+y6)/9 .... (6)
****** is performed and the coordinate (x0, y0) of the middle point C is searched for.

[0198] And the image of a dial 101 is displayed centering on the location of this middle point C (x0, y0) (step S73).
[0199] And when there is migration of a location, as it is shown in (Y of step S74), and drawing 36 nine-point Pa-Pc and in G1-G6 One point is specified as an observing point nine-point Pa-Pc and in G1-G6 (this example the point Pa), and the nearest detecting point is made into the moving point of an observing point at an observing point in the case of migration of a location (in this example, it displays as point Pa'). The middle point C as a core of a circle Angle-of-rotation thetam of the circle concerned is computed from the observing point Pa (xa, ya) and two points of moving point Pa' (xa', ya') (step S75). Step S74 has realized a migration detection means and migration detection processing.
[0200] That is, migration length L=root(xa' - xa) 2+(ya' - ya) 2 radius r=root(xa-x0) 2+(ya-y0) 2 are calculated (also see drawing 37), and it is angle-of-rotation thetam=(360xL)/(2x pixr) from this result. (However, pi circular constant)
********.
[0201] And according to angle-of-rotation thetam, the image of a dial 101 is rotated and displayed centering on the middle point C (step S76). Steps S73, S75, and S76 have realized an actuation image display means and actuation image display processing. Moreover, actuation according to angle-of-rotation thetam is received and performed (step S77). Step S77 has realized an actuation means and actuation processing. That is, when a dial 101 operates voice volume as mentioned above, voice volume will be operated according to the magnitude of angle-of-rotation thetam. When no longer pointing to three on screen 2a, (Y of step S78) and the display of a dial 101 are eliminated (step S79).
[0202] Another example of the actuation image displayed on screen 2a is explained.
[0203] As shown in drawing 38 , when it points to coincidence to five on screen 2a with five fingers of one hand etc., a door 102 is displayed on the location where it is beforehand set up near [the] the five points (drawing 38 (a)). And if the location of five points to which it pointed as it was is moved below (or upper part), a door 102 will open gradually with migration of the location of five points, and the pallet 103 which is an actuation image will appear under a door 102 (drawing 38 (b)). The image of a door 102 and a pallet 103 is beforehand contained in the drawing software of a hard disk 17. And various actuation can be inputted on a pallet 103 by pointing to one point from which a user differs on a pallet 103, respectively one by one. Since a door 102 is displayed and the pallet 103 which is an actuation image is first displayed on the bottom of a door 102 after that in this example, it is suitable when displaying the actuation image for performing the actuation image which you want to display immediately only by pointing to a screen 2a top, for example, the input which changes a initial value.
[0204] Processing about this pallet 103 is specifically performed as follows. Drawing 39 is a flow chart explaining the processing in this case. First, it detects that coincidence points to five on screen 2a (Y of step S81). Since a total of 25 points of the real image of five points and the virtual image of 20 points are detected when it cannot be necessary to specify the exact coordinate of five points and points to five on screen 2a also in this example, thereby, it is detectable that actually pointing is five points.
[0205] And the same operation as (6) is performed also here, and the coordinate (x0, y0) of the middle point C of a total of 25 points is searched for (step S82). (refer to drawing 40) And the image of a door 102 is displayed on screen 2a centering on the middle point C (step S83). Step S83 has realized a door display means and door display processing.
[0206] Then, although (Y of step S84) and the location of the middle point C are also caudad moved when the location of five points to which the user is pointing is dragged caudad as it was and there is migration of the location of five points, it is not necessarily in agreement with the drag direction. Step S84 has realized a migration detection means and migration detection processing. Since the thing which is the need is the migration length to a lower part, if it sets the coordinate of C point after moving the coordinate of C point before migration (x0, y0) to (x1, y1) By "l=y1-y0", the migration length l to a lower part is found (refer to drawing 41) (step S85), and the image of a door 102 is lowered and displayed only for the migration length l minutes, and a pallet 103 is displayed on the location of the first door 102 (step S86). Step S86 has realized a door modification means, door modification processing, an actuation image display means, and actuation image display processing. It is made for the

display of this pallet 103 to be whether a pallet 103 appears gradually from under a door 102 by displaying only the location of a door 102, and the image of a part with which it is not covered.
[0207] And when actuation of a pallet 103 is made, (Y of step S87) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S88), and when termination of a display of a pallet 103 is directed on a pallet 103, the display of (Y of step S89), a door 102, and a pallet 103 is ended (step S90). Step S88 has realized an actuation means and actuation processing.
[0208] Another example of the actuation image displayed on screen 2a is explained.
[0209] As shown in drawing 42 , it is not simultaneous on screen 2a, and when it points to three points to coincidence one by one, the pallet 104 which is an actuation image is displayed on the location where it is beforehand set up near [the] the three points. The image of a pallet 104 is contained in the drawing software stored in the hard disk 17. In this case, a pallet 103 does not appear gradually with the drag of a door 102 like the above-mentioned example, but since a pallet 104 is what is displayed immediately, it is suitable for the display of the actuation image which you want to display immediately only by pointing to a screen 2a top.
[0210] As shown in drawing 43 , after the processing in this case detects one point (point A) (Y of step S91) (refer to drawing 44), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step (refer to drawing 45) S92). Furthermore, if one point (point C) of an exception is detected, with these two points maintained (Y of step S93) (refer to drawing 46), a pallet 104 will be displayed on the location where it is beforehand set up near these three points (step S94). Step S94 has realized an actuation image display means and actuation image display processing.
[0211] In this case, since it can also perform easily detecting the exact coordinate of three points (points A, B, and C), you may make it determine the display position of a pallet 104 from that exact coordinate of three points, although it may ask for the middle point of the real image of three points, and the virtual image of six points like the above-mentioned and a pallet 104 may be displayed on the location of the predetermined direction of the middle point concerned, and predetermined distance.
[0212] That is, although Points A, B, C, and D will be detected if Point B is directed with the point A directed as shown in drawing 45 , it turns out from the beginning that an A point is a real image (drawing 44). Since Points B and D should not be detected supposing Point C is the real image of the 2nd point, and Points B and C should not be detected supposing Point D is the real image of the 2nd point, a B point is judged to be the real image of the 2nd point. Next, since Points I, F, D, C, and E will not be detected if Point H is the real image of the 3rd point supposing Points A and B are decided as shown in drawing 46 , Point H is judged to be a virtual image. The same decision is repeated and it is judged with Points A, B, and C being real images.
[0213] After the display (step S94) of a pallet 104, when actuation of a pallet 104 is made, (Y of step S95) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S96), and when termination of a display of a pallet 104 is directed on a pallet 104, (Y of step S97) and the display of a pallet 104 are ended (step S98).
[0214] Another example of the actuation image displayed on screen 2a is explained.
[0215] If it points to one point (point Pa) on screen 2a, it points to the 2nd (point Pb) point in this condition and this location of the 2nd point is moved up and down as shown in drawing 47 , the slider bar 105 which is an actuation image will be displayed on the location of the 2nd point to which it is pointing. The image of a slider bar 105 is contained in the drawing software in a hard disk 17. This slider bar 105 as well as the case of a dial 101 is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1, etc.
[0216] As shown in drawing 48 , after the processing in this case detects one point (point A) (Y of step S101) (refer to drawing 49), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S102). Then, when migration of the 2nd (point B) point is detected with the first directions of one point (point A) maintained, it carries out by displaying the image of a slider bar 105 on (Y of step S103), and the location of the 2nd (point B) point (step S104). Step S103 realizes a

migration detection means and migration detection processing, and step S104 has realized an actuation image display means and actuation image display processing.
[0217] Detection of the exact coordinate location of Points A and B can be performed using the technique mentioned above below with reference to drawing 23 . Thereby, it can judge with Points A and B being real images among point A-D. and the time of the location of Point B moving -- the coordinate (refer to drawing 49 (x0, y0)) of the location of the original point B -- the coordinate of the location of the point B after migration -- ** (refer to drawing 50 (x1, y1)), if it carries out By "l=y1-y0", since vertical migration length can be found, the image of a slider bar 105 can be displayed on the location which only distance l moved perpendicularly.
[0218] And actuation (adjustment of voice volume etc.) according to the distance l which moved is received and performed (step S105). Step S105 has realized an actuation means and actuation processing. Then, when detection of the two-point coincidence of Points A and B is no longer made, (Y of step S106) and the display of a slider bar 105 are eliminated (step S107).
[0219] In the above, the example of various actuation images was explained. Next, the processing for judging the exception of these actuation images and displaying a suitable actuation image according to the directions on screen 2a, is explained.
[0220] As shown in drawing 51 , sequential detection of the two points is carried out on screen 2a (Y of step S111), when moving one point detected behind, it shifts to the processing processing described above with reference to (Y of step S112), and drawing 48 (step S113), and a slider bar 105 (refer to drawing 47) is displayed. In this case, when there is no migration of one point detected behind, it shifts to the processing described above with reference to (N of step S112), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.
[0221] Also when two points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S115), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.
[0222] When sequential detection of the three points is carried out on screen 2a, it shifts to the processing described above with reference to (Y of step S116), and drawing 43 (step S117), and a pallet 104 is displayed (refer to drawing 42).
[0223] When three points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S118), and drawing 34 (step S119), and a dial 101 is displayed (refer to drawing 33).
[0224] When five points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S120), and drawing 39 (step S121), and a pallet 103 is displayed (refer to drawing 38). Processing of steps S111-S121 has realized an actuation image display means and actuation image display processing.
[0225] Below, the example of a display of other actuation images is explained briefly.
[0226] As shown in drawing 52 , when it points to two points (points A and B) one by one on screen 2a So that the predetermined object 106 which is an actuation image is displayed, and the distance of these points A and B may be expanded and it may be made to reduce in those two points When moving the location of Points A and B, it responds to the magnitude of the migration length, and it expands and reduces and you may make it display the magnitude of an object 106. An object 106 is the icon 94 mentioned above.
[0227] Drawing 53 is a flow chart in this case. Namely, after detecting one point (point A) (Y of step S131), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S132). When Points A and B are moved, (Y of step S133) and an object 106 are displayed (step S134). Then, the distance la of the beginning of Point A and Point B, A difference with the distance lb after migration is searched for, the range difference lc of the distance la and distance lb is searched for (step S135), and it responds to the magnitude of the range difference lc, and an object 106 is expanded and it reduces (step S136). By step S133, S134 realizes an actuation image display means and actuation image display processing, and step S136 has realized an enlarging-or-contracting means and enlarging-or-contracting processing for a migration detection means and migration detection processing.

[0228] As shown in drawing 54 , when others and three points (points B, C, and D) are detected to coincidence, maintaining this detection of one point after detection of one point (point A), you may make it display a pallet 104, although he is trying to display a pallet 104 in the example mentioned above with reference to drawing 42 - drawing 46 when sequential detection of the points A, B, and C is carried out.
[0229] Furthermore, although a slider bar 105 is displayed on Point B and he is trying for a slider bar 105 to move with migration of Point B in the example mentioned above with reference to drawing 47 - drawing 50 , a slider bar 105 is displayed ranging over Points A and B, and you may make it a slider bar 105 move with vertical migration of Points A and B, as shown in drawing 55 .
[0230]
[Effect of the Invention] By easy actuation which points to two or more [on a screen] with the finger of one hand etc., since invention given in claims 1 and 12 can display a required actuation image near the location to which it pointed etc., it can operate an actuation image on a screen at hand immediately, and it can raise operability. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.
[0231] In invention given in claims 1 and 12, since invention given in claims 2 and 13 does not display an actuation image when a certain amount of time interval is opened and it points one by one to two or more [on a screen], it can distinguish easily the case where it points to two or more [on a screen], without aiming at the display of an actuation image.
[0232] In invention according to claim 1, 2, 12, or 13, since invention given in claims 3 and 14 does not display an actuation image when a certain amount of distance spacing is opened and it points to two or more [on a screen], it can distinguish easily the case where it points to two or more [on a screen], without aiming at the display of an actuation image.
[0233] Invention of a publication can display an actuation image on claims 4 and 15 in the class, number, or display position beforehand registered into 1 of either [claims 1-3 and] 12-14 in invention of a publication.
[0234] Since invention given in claims 5 and 16 can be registered into a request of a user about the detail of the actuation image displayed on claims 4 and 15 in invention of a publication, it can raise operability further.
[0235] In invention given in claims 1 and 12, it points on a screen to invention given in claims 6 and 17, and a user can perform predetermined actuation by migration of a location.
[0236] It can be made to display that it pointed on the screen to invention given in claims 7 and 18, and it operated the actuation image in invention given in claims 6 and 17 according to migration of a location.
[0237] It can be made easy to set invention given in claims 8 and 19 to invention given in claims 1 and 12, to expand, to reduce to the size of a request of an actuation image easily, and to operate it.
[0238] Since invention given in claims 9 and 20 can display an actuation image from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved, when it points to two or more locations on a screen in invention of a publication to claims 1 and 12, and displaying an actuation image not to not much show immediately, it is suitable.
[0239] Invention of a publication can use an icon, a dial, a slider bar, or a pallet for 1 of either [claims 1-9 and] 12-20 as an actuation image in invention of a publication at claims 10 and 21.
[0240] Invention of a publication can make claims 11 and 22 display various kinds of actuation images on 1 of either [claims 1-10 and] 12-21 alternatively by the difference in how on a screen to point in invention of a publication.
[0241] Invention according to claim 23 can do so the same effectiveness as invention of a publication to one 1 of claims 12-22.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to information input/output system and a program.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] It has the indicating equipment for displaying an alphabetic character and an image in recent years, the coordinate input unit which arranged the information input screen (touch panel side) in the front face of an indicating equipment, and the control unit which performs the display control of an indicating equipment based on the input from a coordinate input unit, and the information input/output system which constituted the screen and the write-in field of an electronic blackboard using the indicating equipment and the coordinate input unit is offered.
[0003] for example, made in Smart Technologies (SMART Technologies Inc.) is smart -- 2000 is in the condition which projected the image of an alphabetic character, a picture, a graphic form, and a graphic on the panel using the liquid crystal projector connected to the computer, and performs processing which downloads the information on handwritten to a computer using the coordinate input unit (write-in field) arranged in the front face of the plane of projection (screen) of a panel. And handwritten information and image information are compounded within a computer, and it enables it to express as real time through a liquid crystal projector again.
[0004] Since the image inputted using the coordinate input unit can be displayed in piles as an overwrite image to the image on the screen currently displayed with the display, at a meeting, a presentation, schools, etc., it is already used widely, and the use effectiveness is highly estimated by such information input/output system. Moreover, it is used also as a teleconference by including communication facility, such as voice and an image, in such information input/output system, and connecting between remote places by the communication line.
[0005] Moreover, the technique of various methods is proposed as a coordinate input unit used for such information input/output system. That is, the optical thing besides [which has a physical field like a touch panel side as this coordinate input device] a method is proposed (for example, refer to JP,11-110116,A).

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EFFECT OF THE INVENTION

[Effect of the Invention] By easy actuation which points to two or more [on a screen] with the finger of one hand etc., since invention given in claims 1 and 12 can display a required actuation image near the location to which it pointed etc., it can operate an actuation image on a screen at hand immediately, and it can raise operability. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.
[0231] In invention given in claims 1 and 12, since invention given in claims 2 and 13 does not display an actuation image when a certain amount of time interval is opened and it points one by one to two or more [on a screen], it can distinguish easily the case where it points to two or more [on a screen], without aiming at the display of an actuation image.
[0232] In invention according to claim 1, 2, 12, or 13, since invention given in claims 3 and 14 does not display an actuation image when a certain amount of distance spacing is opened and it points to two or more [on a screen], it can distinguish easily the case where it points to two or more [on a screen], without aiming at the display of an actuation image.
[0233] Invention of a publication can display an actuation image on claims 4 and 15 in the class, number, or display position beforehand registered into 1 of either [claims 1-3 and] 12-14 in invention of a publication.
[0234] Since invention given in claims 5 and 16 can be registered into a request of a user about the detail of the actuation image displayed on claims 4 and 15 in invention of a publication, it can raise operability further.
[0235] In invention given in claims 1 and 12, it points on a screen to invention given in claims 6 and 17, and a user can perform predetermined actuation by migration of a location.
[0236] It can be made to display that it pointed on the screen to invention given in claims 7 and 18, and it operated the actuation image in invention given in claims 6 and 17 according to migration of a location.
[0237] It can be made easy to set invention given in claims 8 and 19 to invention given in claims 1 and 12, to expand, to reduce to the size of a request of an actuation image easily, and to operate it.
[0238] Since invention given in claims 9 and 20 can display an actuation image from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved, when it points to two or more locations on a screen in invention of a publication to claims 1 and 12, and displaying an actuation image not to not much show immediately, it is suitable.
[0239] Invention of a publication can use an icon, a dial, a slider bar, or a pallet for 1 of either [claims 1-9 and] 12-20 as an actuation image in invention of a publication at claims 10 and 21.
[0240] Invention of a publication can make claims 11 and 22 display various kinds of actuation images on 1 of either [claims 1-10 and] 12-21 alternatively by the difference in how on a screen to point in invention of a publication.
[0241] Invention according to claim 23 can do so the same effectiveness as invention of a publication to one 1 of claims 12-22.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, when operating various applications etc. on that screen using the above information input/output system, it is possible to carry out by displaying a tool bar on a screen, and carrying out by pointing to the icon on this tool bar by directions members, such as a finger and Penn, or operating remote control of dedication. When pointing to an icon by the directions member, a coordinate input unit detects the coordinate of the location to which the directions member concerned points, and it judges to which icon it is pointing.
[0007] The display used with information input/output system However, 40 inches, If the thing of the big screen of 50 inches is assumed and it is going to point to the icon of the tool bar on a screen (usually displayed on the upper and lower sides of a screen, or an edge on either side) by the directions member Compromise to the location where the desired icon is displayed, or [lengthening the limbs greatly one by one, in order that a user may operate an icon] Or it is necessary to start specially, whenever it clicks on an icon, in sitting on a chair and operating it, and there is fault that actuation is very complicated.
[0008] Moreover, in operating [since it cannot be operated on the screen of information input/output system when operating it with remote control of dedication as mentioned above, while looking at a screen, or] it, explaining, there is fault that actuation is very complicated too.
[0009] The purpose of this invention is making it possible to operate an icon on a screen at hand immediately, and raising operability.
[0010] Another purpose of this invention is enabling it for the actuation performed by pointing to one on a screen to distinguish easily, when raising this operability.
[0011] Another purpose of this invention is enabling it to distinguish easily the case where it points to two or more [on a screen], without aiming at the display of an icon, when raising the aforementioned operability.
[0012] Another purpose of this invention is enabling it to display an icon in the class, number, or display position which is registered beforehand in the aforementioned case.
[0013] Another purpose of this invention is raising operability further, as a user's can register with a request about the detail of the icon which is displayed in the aforementioned case.
[0014] Another purpose of this invention is that point on a screen and a user enables it to perform predetermined actuation by migration of a location.
[0015] Another purpose of this invention is enabling it to display that it pointed on the screen and the actuation image was operated according to migration of a location.
[0016] Another purpose of this invention is making an actuation image easy to expand, to reduce to desired size easily, and to operate it.
[0017] Another purpose of this invention is displaying various kinds of actuation images alternatively by the difference in how on a screen pointing.

[Translation done.]

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MEANS

[Means for Solving the Problem] Invention according to claim 1 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the information input/output system which displays said display based on the coordinate detected with said coordinate input unit When it detects pointing to two or more locations in said screen top with the storage which registers the actuation image beforehand, and said coordinate input unit It is the information input/output system characterized by having an actuation image display means to display the actuation image registered into the predetermined location on said screen.
[0019] In this specification, it is the graphic form displayed on a screen, and by performing predetermined actuation with a finger etc. to that graphic form, an actuation image receives that a user performs various actuation to information input/output system, and are an icon, a dial, a slider bar, a pallet, etc.
[0020] Therefore, by easy actuation which points to two or more [on a screen] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.
[0021] the time check which clocks the time amount of a between the time of invention according to claim 2 pointing to said two or more locations in invention according to claim 1, respectively -- a means and the 1st comparison means which judges whether it is below the predetermined time to which this clocked time amount is set beforehand -- having -- said actuation image-display means -- said time check -- it is characterized by what said actuation image displays for on condition that time amount is below said predetermined time.
[0022] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.
[0023] A ranging means by which invention according to claim 3 calculates the distance between the coordinates which pointed to said two or more locations, respectively in invention according to claim 1 or 2, It has the 2nd comparison means which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display means is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.
[0024] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.
[0025] Invention according to claim 4 is set to invention given in one 1 of claims 1-3. Said storage It is registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates. Said

actuation image display means is characterized by what said actuation image is displayed for according to the contents of registration of said storage.
[0026] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.
[0027] In invention according to claim 4, invention according to claim 5 is characterized by having an updating means to update the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out, a reception means to receive the input of the contents of registration to said storage, and.
[0028] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.
[0029] Invention according to claim 6 carries out having an actuation means receive and perform predetermined actuation according to detection distance and a direction concerned as the description in invention according to claim 1, when there is said detection by said migration detection means, where a migration detection means point and detect the distance and the direction of migration of a location and said actuation image on said screen are displayed.
[0030] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.
[0031] In invention according to claim 6, invention according to claim 7 is characterized by what the display position on said screen of said actuation image is changed for according to detection distance and a direction concerned, when said actuation image display means has detection by said migration detection means, where said actuation image is displayed.
[0032] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.
[0033] Invention according to claim 8 is characterized by to have an enlarging-or-contracting means responds in detection distance and a direction concerned, and expand or reduce the magnitude on said screen of said actuation image in invention according to claim 1, when there is said detection by a migration detection means point and detect the distance and the direction of migration of a location and said migration detection means on said screen.
[0034] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.
[0035] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 1, invention according to claim 9 A door display means to display a door on the predetermined location on said screen, and a migration detection means to point on said screen and to detect the distance and the direction of migration of a location, Where said door is displayed, when there is detection of said migration Having a door modification means to change the display position on said screen of said door according to detection distance and a direction concerned, said actuation image display means displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.
[0036] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.
[0037] Invention according to claim 10 is characterized by what said actuation image is an icon, a dial, a slider bar, or a pallet in invention given in one 1 of claims 1-9.
[0038] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.
[0039] Invention according to claim 11 is set to invention given in one 1 of claims 1-10. Said storage Having registered two or more kinds of said actuation images, said actuation image display means is indicated said actuation image by said thing [carrying out by choosing more than one from the actuation images of a class], corresponding [of said location to which it pointed / concerned] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.
[0040] Therefore, various kinds of actuation images can be alternatively displayed by the difference in

how on a screen to point.
[0041] Invention according to claim 12 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the program to the computer which makes a computer perform controlling information input/output system which displays said display based on the coordinate detected with said coordinate input unit which can be read When it detects pointing to two or more locations in said screen top with said coordinate input unit, it is the program characterized by making a computer perform actuation image display processing which displays the actuation image beforehand registered into storage on the predetermined location on said screen.
[0042] Therefore, by easy actuation which points to two or more [on a screen] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.
[0043] the time check which clocks the time amount of a between the time of invention according to claim 13 pointing to said two or more locations in invention according to claim 12, respectively -- with processing 1st comparison processing which judges whether it is below the predetermined time to which this clocked time amount is set beforehand is performed to a computer -- making -- said actuation image display processing -- said time check -- it is characterized by what said actuation image is displayed for on condition that time amount is said below predetermined time.
[0044] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.
[0045] Invention according to claim 14 is set to invention according to claim 12 or 13. The ranging processing which calculates the distance between the coordinates which pointed to said two or more locations, respectively, A computer is made to perform 2nd comparison processing which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display processing is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.
[0046] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [on a screen], the case where it points to two or more [on a screen], without aiming at the display of an actuation image is easily distinguishable.
[0047] Invention according to claim 15 is set to invention given in one 1 of claims 12-14. Said actuation image display processing It is characterized by what said actuation image is displayed [among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates] for according to the contents of registration of said storage registered about said class at least.
[0048] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.
[0049] In invention according to claim 15, invention according to claim 16 is characterized by making a computer perform the update process which updates the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out with the reception processing which receives the input of the contents of registration to said storage.
[0050] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.
[0051] Invention according to claim 17 makes a computer perform migration detection processing of pointing on said screen and detecting the distance and the direction of migration of a location in invention according to claim 12, and actuation image-display processing carries out what it is what changes the display position on said screen of said actuation image according to detection distance and a direction concerned as the description, when this detection is in the condition that said actuation image was displayed.

[0052] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.
[0053] In invention according to claim 17, invention according to claim 18 is characterized by making a computer perform actuation processing which receives and performs predetermined actuation according to detection distance and a direction concerned, when there is said detection by said migration detection means, where said actuation image is displayed.
[0054] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.
[0055] It carries out that invention according to claim 19 makes a computer perform the enlarging-or-contracting processing which responds in detection distance and a direction concerned, and expands or reduces in the magnitude on said screen of said actuation image when there is said detection by the migration detection processing in_which point and the distance and the direction of migration of a location are detected and said migration detection processing on said screen, in invention according to claim 12 as the description.
[0056] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.
[0057] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 12, invention according to claim 20 Door display processing which displays a door on the predetermined location on said screen, and migration detection processing in which point on said screen and the distance and the direction of migration of a location are detected, Where said door is displayed, when there is detection of said migration A computer is made to perform door modification processing in which the display position on said screen of said door is changed according to detection distance and a direction concerned. Said actuation image display processing It is displayed that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.
[0058] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.
[0059] Invention according to claim 21 is characterized by what said actuation image display processing displays an icon, a dial, a slider bar, or a pallet for as said actuation image in invention given in one 1 of claims 12-20.
[0060] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.
[0061] It is characterized by carrying out by invention according to claim 22 choosing in invention given in one 1 of claims 12-21 from the actuation images with which two or more kinds of said actuation image display processings are registered into said storage in the display of said actuation image, corresponding [of said location to which it pointed / concerned] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.
[0062] Therefore, various kinds of actuation images can be alternatively displayed by the difference in how on a screen to point.
[0063] Invention according to claim 23 is a storage characterized by having memorized the program of a publication to one 1 of claims 12-22.
[0064] Therefore, the same operation as invention of a publication and effectiveness can be done so to one 1 of claims 12-22.
[0065]
[Embodiment of the Invention] The gestalt of 1 implementation of this invention is explained.
[0066] Drawing 1 is the appearance perspective view showing roughly the information input/output system 1 which is the gestalt of this operation, and drawing 2 is the block diagram showing electric connection of the information input/output system 1. As shown in drawing 1 and drawing 2 , the information input/output system 1 is equipped with the panel section 4 which is the I/O device which consists of the plasma display panels (PDP) 2 and the coordinate input units 3 which are an indicating

equipment, the computers 5, such as a personal computer, the scanner 6 for reading the image of a manuscript, the printer 7 that outputs image data to the detail paper, and the device stowage 9 which contains a video player 8.
[0067] PDP2 is a thing big screen type [, such as 40 inches available as an electronic blackboard and 50 etc. inches,], and CRT, LCD, etc. may be used for it as long as it is this big screen type of display. Moreover, although illustration is omitted, the video input terminal and the loudspeaker are formed in PDP2, and a video player 8 is begun, in addition various information machines and equipment and AV equipments, such as a laser disk player, a DVD player, and a video camera, are connected, and it has composition which can use PDP2 as a big screen monitor.
[0068] As shown in drawing 2 , the information input/output system 1 is a configuration which connects PDP2, a scanner 6, a printer 7, and a video player 8 to a computer 5, respectively, and controls the whole system by the computer 5. Moreover, the controller 10 for coordinate input unit 3 which performs the operation of the position coordinate in information input area 3a directed by predetermined bodies, such as directions members, such as Penn, and a fingertip, etc. is connected to the computer 5, and the coordinate input unit 3 is also connected to the computer 5 through this controller 10. Moreover, it is also possible to transmit the data which could connect the information input/output system 1 to the network 11 through the computer 5, and displayed the data created by other computers connected on the network 11 on PDP2, or were created with the information input/output system 1 to other computers.
[0069] Next, a computer 5 is explained. Here, drawing 3 is the block diagram showing the electrical installation of each part built in a computer 5. As shown in drawing 3 , CPU12 by which a computer 5 controls the whole system, and RAM14 used as a work area of ROM13 and CPU12 which recorded the bootstrap etc. are connected through the bus 21. Moreover, the keyboard 15 for inputting an alphabetic character, a numeric value, various directions, etc. into a bus 21 through a predetermined interface, The mouse 16 for performing migration, a range selection, etc. of cursor, and the hard disk 17 which is a store, With the graphics board 18 which is connected to PDP2 and controls the display of the image to the PDP2 The interface (I/F) 20 for the network card (or modem) 19 for connecting with a network 11 being connected, and connecting controller 10, scanner 6, and printer 7 grade is also connected.
[0070] Various application program 24 grades, such as the device driver 23 for operating the coordinate input device 3 on a computer 5 through an operating system (OS) 22 and a controller 10, and drawing software word processor software, spreadsheet software presentation software calibration software, are stored in the hard disk 17.
[0071] moreover, the record medium 26 (a flexible disk --) which recorded various kinds of program codes (control program) of OS22, a device driver 23, or various application program 24 grades on the computer 5 A hard disk, an optical disk (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), The program reader 25 (it responds to the recording method of a record medium 26) which is equipment which reads the program code currently recorded for the ability using various kinds of media, such as a magneto-optic disk (MO) and a memory card equipments, such as flexible disk drive equipment, CD-ROM drive equipment, and MO drive equipment, -- it can use -- it is carried.
[0072] The various application programs 24 are executed by CPU12 under control by OS22 started according to the injection of the power source to a computer 5. For example, when drawing software is started by predetermined actuation of a keyboard 15 and a mouse 16, the predetermined image based on drawing software is displayed on PDP2 through a graphics board 18. Moreover, a device driver 23 is also started with OS22, and will be in the condition in which the data input from the coordinate input device 3 through a controller 10 is possible. Thus, where drawing software is started, when a user traced and draws an alphabetic character, a graphic form, etc. on information input area 3a of the coordinate input unit 3 by directions members, such as a finger, Rhine to which the migration locus of a directions member is connected to the image on the screen where the coordinate information on the migration locus of the directions member is inputted into a computer 5 as image data, for example, is displayed on PDP2 is displayed in piles as an overwrite image. Or the image of the field to which the migration locus of a directions member is connected conversely is eliminated. And he is trying for the location on screen 2a of PDP2 which displays this image in piles or eliminates an image to lap with the location which the

user traced and drew by directions members, such as a finger, by information input area 3a.
[0073] If the case where a line and an alphabetic character are overwritten is explained more to a detail at an example, CPU12 of a computer 5 writes the drawing information for drawing a line and an alphabetic character based on the inputted image data in the video memory (not shown) which generates and is prepared for a graphics board 18 according to the position coordinate based on the inputted coordinate information. Then, when a graphics board 18 transmits to PDP2 by making into a picture signal drawing information written in video memory, the same alphabetic character as the alphabetic character written by the user will be displayed on PDP2. That is, since the computer 5 recognizes the coordinate input device 3 as a pointing device like a mouse 16, by computer 5, the same processing as the case where an alphabetic character is written using a mouse 16 on drawing software will be performed.
[0074] Next, the coordinate input unit 3 is explained to a detail. In addition, as a coordinate input unit 3 which can be applied to the information input/output system 1 of the gestalt of this operation, the thing of the various methods with which detection methods differ can be considered. For example, a touch panel can be mentioned as a coordinate input device 3 which detects mechanically and electrically the coordinate location to which a directions member points on screen 2a of PDP2 (information input area 3a).
[0075] However, below, five things (1st coordinate input unit 3A- 5th coordinate input unit 3E) from which a detection method differs are mentioned about the coordinate input unit 3 which detects optically the coordinate location to which a directions member points as a more suitable example on screen 2a of PDP2 (information input area 3a), and the configuration and principle are explained.
[0076] A. Explain the 1st coordinate input unit **** and 1st coordinate input unit 3A based on drawing 4 - drawing 8 . The so-called recursive light electric shielding method is used for this 1st coordinate input unit 3A.
[0077] Here, drawing 4 is the explanatory view showing roughly the configuration of 1st coordinate input unit 3A. As shown in drawing 4 , coordinate input unit 3A is equipped with information input area 3a of the shape of an oblong square in the size corresponding to the size of screen 2a of PDP2. This information input area 3a is a field which enables the input of an alphabetic character, a graphic form, etc. by tracing with a finger etc. Near the corner located in the lower part both ends of this information input area 3a, the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R) which performs luminescence and light-receiving is formed by whenever [predetermined champing-angle]. From these optical units 27, by the shape of a sector which consists of a flat surface or a bundle of light (probe light) almost of nothing, for example, L1, L2, L3, ..., Ln (R1, R2, R3, ..., Rn), for a flat surface, the thin film-like flux of light film is floodlighted in parallel along the front face of screen 2a of PDP2 so that it may spread throughout information input area 3a.
[0078] Moreover, the recurrence reflective member 28 is formed in the periphery except the lower part of information input area 3a of the coordinate input unit 3. This recurrence reflective member 28 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on whenever [that incident angle]. For example, it will be reflected by the recurrence reflective member 28 and the probe light L3 floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light L3' which follows the same optical path again. That is, information input area 3a is formed also of the recurrence reflective member 28.
[0079] Next, the optical unit 27 is explained. Here, drawing 5 is the block diagram showing the structure of the optical unit 27 roughly. In addition, although drawing 5 shows the subject the direction of x-z, it is drawing which looked at the component same about the part shown with a two-dot chain line from another (the direction of x-y, or the direction of y-z).
[0080] As shown in drawing 5 , the optical unit 27 is equipped with the floodlighting means 29 and the light-receiving means 30. The floodlighting means 29 is equipped with the light sources 31, such as possible LD (LaserDiode) of extracting a spot to some extent, and Pinpoint LED (Light Emitting Diode). The light perpendicularly irradiated from this light source 31 to screen 2a of PDP2 is collimated

in the x directions by the cylindrical lens 32 which can change only the scale factor of an one direction. The light collimated by the cylindrical lens 32 in the x directions is condensed to the direction of y by the cylindrical lenses 33 and 34 of two sheets the cylindrical lenses and distribution of curvature cross at right angles in a cylindrical lens 32. That is, the field which condensed the light from the light source 31 to the line will be formed behind a cylindrical lens 34 of an operation of these cylindrical-lens groups (cylindrical lenses 32, 33, and 34). The slit plate 35 which has a narrow slit long and slender in x directions in the direction of y is arranged here. Therefore, the light which passed the cylindrical-lens group (cylindrical lenses 32, 33, and 34) forms the linear secondary light source 36 in the slit location of the slit plate 35. The light emitted from the secondary light source 36 is turned up by the half mirror 37, it is the parallel light which met the front face of screen 2a, without spreading in the perpendicular direction of screen 2a of PDP2, and as in parallel as screen 2a, serves as flux of light film of the shape of a sector centering on the secondary light source 36, and advances information input area 3a. If it puts in another way, sector-like light will form information input area 3a. Condensing optical system is formed with these cylindrical-lens groups (cylindrical lenses 32, 33, and 34) and slit plates 35.

[0081] As mentioned above, it will be recursively reflected by the recurrence reflective member 28, and the flux of light film which became sector-like and ran information input area 3a will follow the same optical path again, and will return to a half mirror 37. Therefore, the flux of light film recursively reflected by the recurrence reflective member 28 also forms information input area 3a.

[0082] The retroreflection light which was reflected by the recurrence reflective member 28 and returned to the half mirror 37 penetrates a half mirror 37, and it carries out incidence to the light-receiving means 30. After retroreflection light which carried out incidence to the light-receiving means 30 is made into a line through the cylindrical lens 38 which is a condenser lens, it is received in a location which is different for every probe light in CCD39 prepared at intervals of distance f (f is the focal distance of a cylindrical lens 38) from this cylindrical lens 38. In addition, CCD39 of the gestalt of this operation is 1-dimensional CCD, and the number of pixels is made into 2,048 pixels.

[0083] In the direction of the z-axis, the retroreflection light reflected in the detail by the recurrence reflective member 28 does not receive an operation of a cylindrical lens 38, but while it had been collimated by it, it reaches CCD39. Moreover, image formation of the retroreflection light is carried out on CCD39 which spread so that it might condense at the core of a cylindrical lens 38 with screen 2a of PDP2, if parallel, consequently was installed in the focal plane of a cylindrical lens 38 in response to the operation of a cylindrical lens 38. Thereby, according to the existence of retroreflection light, distribution of optical reinforcement is formed on CCD39. That is, when retroreflection light is interrupted by the directions member P, the point (peak point mentioned later) that optical reinforcement is weak will arise in the location equivalent to the retroreflection light by which it was interrupted on CCD39. CCD39 which received retroreflection light generates the electrical signal based on the optical intensity distribution of retroreflection light (probe light), and outputs it to the controller 10 mentioned above. In addition, as shown in drawing 5 , both the secondary light source 36 and the cylindrical lens 38 are arranged in the location of distance d to a half mirror 37, and are in physical relationship [****].

[0084] Here, drawing 6 is the block block diagram of the controller 10 which performs processing which specifies the coordinate of the location where the light which the electrical signal based on the optical intensity distribution of retroreflection light is inputted from a photo detector 39, and advances information input area 3a was interrupted. This controller 10 calculates luminescence control of the light source (LD) 31 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R), and the output from CCD39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). As shown in drawing 6 , the bus connection of the interface 43, A/D converter 44, and the LD driver 45 for connecting with ROM41 which CPU40 which controls each part intensively is formed in the controller 10, and records a program and data on this CPU40, RAM42 which stores various data, enabling free rewriting and functions as a work area, and a computer 5 is carried out. Moreover, the bus connection of EEPROM47 which is the memory of a hard disk 46 or a non-volatile which stores various kinds of program codes (control program) is carried out to CPU40. The

microcomputer is constituted by CPU40, ROM41, and RAM42 here. The program readers 48, such as flexible disk drive equipment which is equipment which reads the program code currently recorded on the record medium 49 which recorded various kinds of program codes (control program), i.e., a flexible disk, a hard disk, optical disks (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), the magneto-optic disk (MO), the memory card, etc., CD-ROM drive equipment, and MO drive equipment, are connected to such a microcomputer.

[0085] As a circuit which calculates the output from CCD39, the analog processing circuit 51 is connected to the output terminal of CCD39, as shown in drawing. Within CCD39, the reflected light which carried out incidence to CCD39 is changed into the image data of an analog with the electrical-potential-difference value according to luminous intensity, and is outputted as an analog signal. After this analog signal is processed in the analog processing circuit 51, it is changed into a digital signal by A/D converter 44, and is passed to CPU40. Then, the operation of the 2-dimensional coordinate of the directions member P is performed by CPU40.

[0086] Various kinds of program codes (control program) recorded on various kinds of program codes (control program) or record media 49 which were stored in the hard disk 46 will be written in RAM42 according to the injection of the power source to a controller 10, and various kinds of program codes (control program) will be performed.

[0087] Then, the function performed by CPU40 based on a control program is explained. Here, the coordinate detection processing which is the features-function with which the coordinate input unit 3 of the gestalt of this operation is equipped is explained concretely below.

[0088] Here, drawing 7 is the front view showing an example which pointed by the directions member P to one in information input area 3a of the coordinate input unit 3. When the n-th probe light Ln is interrupted by the directions member P in the light of the shape of a sector which consists of probe light called L1, L2, L3, ..., Ln which were irradiated from left-hand side optical unit 27L as shown in drawing 7 for example, the probe light Ln does not reach the recurrence reflective member 28.

[0089] At this time, the optical intensity distribution on CCD39 are considered. Here, drawing 8 is the explanatory view showing detection actuation of CCD39 typically. Although the optical intensity distribution on CCD39 are almost fixed if the directions member P is not inserted into information input area 3a Since the probe light Ln is not received by CCD39 of the optical unit 27 when the directions member P is inserted into information input area 3a and the probe light Ln is interrupted by the directions member P, as shown in drawing 8 , The position Xn on CCD39 of the optical unit 27 corresponding to the probe light Ln serves as a field (scotoma) where optical reinforcement is weak. Since the location Xn which is the field (scotoma) where this optical reinforcement is weak will appear in the wave of the optical reinforcement outputted from CCD39 as a peak point, CPU40 recognizes the appearance of the peak point in the wave of such optical reinforcement by change of an electrical potential difference, and it detects the location Xn of the scotoma used as the wave-like peak point of this optical reinforcement.

[0090] Moreover, detection of the scotoma location Xn used as the wave-like peak point of optical reinforcement detects the distance from the scotoma location Xn to the main pixel of CCD39 based on the pixel number (for example, setting to drawing 8 the pixel number m) of CCD39.

[0091] The location Xn (the CCD39 top of left-hand side optical unit 27L the XnL and CCD39 top of right-hand side optical unit 27R XnR) which is the field (scotoma) where optical reinforcement is weak corresponds with the outgoing radiation / incident angle thetan of the interrupted probe light, and can know thetan by detecting Xn. That is, when distance from the scotoma location Xn to the main pixel of CCD39 is set to a, thetan is a function of a. thetan=tan -1 (a/f) ..... (1)
It can express. However, f is the focal distance of a cylindrical lens 38. thetan in left-hand side optical unit 27L is replaced with thetanL here, and a is replaced with XnL.

[0092] Furthermore, it is thetaL=g (thetanL) as a function of XnL asked for include-angle thetaL of the directions member P and left-hand side optical unit 27L to make by (1) formula in drawing 7 with the transform coefficient g of the geometric relative-position relation between left-hand side optical unit 27L and information input area 3a. ..... (2)

However, it can express thetanL=tan -1 (XnL/f).
[0093] Similarly, the notation L in above-mentioned (1) (2) type is transposed to Notation R also about right-hand side optical unit 27R, and it is thetaR=h (thetanR) by the transform coefficient h of the geometric relative-position relation between right-hand side optical unit 27R and information input area 3a. ..... (3)
However, it can express thetanR=tan -1 (XnR/f).
[0094] If [here] w which shows the distance of the center position of CCD39 of left-hand side optical unit 27L, and the center position of CCD39 of right-hand side optical unit 27R to drawing 7 , the two-dimensional coordinate (x y) of the point directed by the directions member P in information input area 3a is the principle of triangulation. X=w-tanthetaR/(tanthetaL+tanthetaR) ..... (4)
Y=w-tanthetaL-tanthetaR/(tanthetaL+tanthetaR) .... (5)
It is computable by carrying out.
[0095] These (1), (2), (3), (4), and (5) types are beforehand stored in the hard disk 46 or the record medium 49 as a part of control program, and the position coordinate (x y) of the directions member P is computed by (1), (2), (3), (4), and (5) type as a function of XnL and XnR. That is, the position coordinate (x y) of the directions member P will be computed by detecting the location of the scotoma on CCD39 of left-hand side optical unit 27L, and the location of the scotoma on CCD39 of right-hand side optical unit 27R.
[0096] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.
[0097] And according to such coordinate input unit 3A, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.
[0098] B. Explain the 2nd coordinate input unit, next coordinate input unit of ** 2nd 3B based on drawing 9 - drawing 11 . In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.
[0099] This 2nd coordinate input unit 3B is the so-called coordinate input unit of a recursive light reflex method.
[0100] Here, drawing 9 is the perspective view showing the directions member 61 used for coordinate input unit 3B. Moreover, drawing 10 is the front view showing an example which pointed by the directions member 61 to one in information input area 3a of coordinate input unit 3B. The recurrence reflective member 62 is formed near the tip of the directions member 61 used in order to point to one in information input area 3a of coordinate input unit 3B, as shown in drawing 9 . This recurrence reflective member 62 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on whenever [that incident angle]. For example, it will be reflected by the recurrence reflective member 62 and the probe light Ln floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light Ln' which follows the same optical path again, as shown in drawing 10 . Therefore, as shown in drawing 10 , in coordinate input unit 3B, it is not necessary to form the recurrence reflective member 28 in information input area 3a like coordinate input unit 3A mentioned above. In addition, the directions member 61 is carrying out the Penn-like configuration, and its quality of the materials, such as rubber and plastics, are more desirable than glossy metal.
[0101] Therefore, it inserts in the suitable location (x y) of information input area 3a of coordinate input unit 3B near [equipped with the recurrence reflective member 62 of such a directions member 61] the tip. For example, when the probe light Ln in the flux of light film of the shape of a sector floodlighted from left-hand side optical unit 27L is reflected by the recurrence reflective member 62 of the directions member 61, the retroreflection light Ln' is received by CCD39 of left-hand side optical unit 27L. Thus, when CCD39 receives retroreflection light Ln', the position Dn on CCD39 corresponding to retroreflection light Ln' serves as a field (bright point) where optical reinforcement is strong. That is, as shown in drawing 11 , on CCD39, the field where optical reinforcement is strong is generated in the location of a location Dn, and a peak appears in the configuration of the luminous-intensity distribution

from CCD39. The location Dn where this peak appears corresponds with the outgoing radiation / incident angle thetan of the reflected probe light, and can know thetan by detecting Dn. That is, the position coordinate (x y) of the directions member 61 will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A of a recursive light electric shielding method which mentioned above also in coordinate input unit 3B of such a recursive light reflex method.

[0102] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0103] And according to such coordinate input unit 3B, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing. In addition, not using the above directions members 61, a finger etc. can also be used as a directions member.

[0104] C. Explain the 3rd coordinate input unit, next 3rd coordinate input unit 3C based on drawing 12 - drawing 14 . In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.

[0105] This 3rd coordinate input unit 3C is the modification of the optical unit in 1st coordinate input unit 3A. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 1st coordinate input unit 3A and the information input area was formed in it, in coordinate input unit 3C, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used.

[0106] Here, drawing 12 is the top view showing the optical unit 70 roughly. As shown in drawing 12 , it has floodlighting means 70a which consists of LD (Laser Diode)71, the half mirror 72 and the polygon mirror 73 which are the light source which the optical unit 70 has a drive circuit (not shown), and carries out outgoing radiation of the laser beam, and a condenser lens 74, and a photo detector 75. The photo detector 75 consists of PDs (Photo Diode) prepared from the condenser lens 74 at intervals of distance f (f is the focal distance of a condenser lens 74). Such an optical unit 70 carries out sequential reflection at a radial by the polygon mirror 73 in which a rotation drive is carried out by the pulse motor (not shown) by predetermined angular-velocity omegat, after turning up the laser beam which carried out outgoing radiation from LD71 by the half mirror 72. Therefore, the optical unit 70 will repeat and floodlight beam light to a radial. That is, information input area 3a will be formed of the beam light floodlighted by the radial from two optical units 70. It is reflected by the polygon mirror 73 and the beam light which it was reflected and carried out incidence to the optical unit 70 on the other hand reaches a half mirror 72. The reflective beam light which reached the half mirror 72 penetrates a half mirror 72, reaches a photo detector 75, and is changed into an electrical signal.

[0107] Next, coordinate input unit 3C which replaced with and applied such an optical unit 70 to the optical unit 27 used by 1st coordinate input unit 3A is explained. If the beam light by which the directions member P is inserted in a certain location in information input area 3a is covered as shown in drawing 13 , since it is not reflected by the recurrence reflective member 28, the beam light will not reach a photo detector 75. Thus, when the beam light by which the directions member P is inserted in a certain location in information input area 3a is covered, a DIP appears in the configuration of the luminous-intensity distribution from a photo detector 75.

[0108] Although optical reinforcement shows "I=I1" when the directions member P is not inserted in information input area 3a as it is shown in drawing 14 , although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, "I=I0" will be shown, when the directions member P is inserted in information input area 3a and recursive light does not return to a photo detector 75. Thus, the part whose optical reinforcement is "I=I0" is a DIP. In addition, among drawing 14 , time amount t=t0 is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.

[0109] Therefore, in the time amount t from which optical reinforcement became "I=I0", if it is t1, the outgoing radiation include angle theta of the beam light covered by the directions member P inserted in

information input area 3a is computed as theta=omega (t1-t0) = omega**t. That is, the outgoing radiation include angle theta (thetanL, thetanR) of the beam light covered by the directions member P inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member P by the technique of triangulation based on those outgoing radiation include angles theta (thetanL, thetanR) will be computed.

[0110] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0111] And according to such coordinate input unit 3C, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0112] D. Explain the 4th coordinate input unit, next 4th coordinate input unit 3D based on drawing 15 - drawing 16 . In addition, about the same part as the part explained by 2nd coordinate input unit 3B and 3rd coordinate input unit 3C, explanation is also omitted using the same sign.

[0113] This 4th coordinate input unit 3D is the modification of the optical unit in 2nd coordinate input unit 3B. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 2nd coordinate input unit 3B and the information input area was formed in it, in 4th coordinate input unit 3D, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used. In addition, since 3rd coordinate input unit 3C explained, the explanation about the optical unit 70 is omitted here.

[0114] Coordinate input unit 3D which replaced with and applied such an optical unit 70 to the optical unit 27 used by 2nd coordinate input unit 3B is explained. As shown in drawing 15 , when the directions member 61 is inserted in a certain location in information input area 3a, retroreflection of the predetermined beam light is carried out in the recurrence reflective member 62 of the directions member 61, and the beam light reaches a photo detector 75. Thus, when retroreflection of the beam light by which the directions member 61 is inserted in a certain location in information input area 3a is carried out, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 75.

[0115] Although optical reinforcement shows "I=I0" when the directions member 61 is not inserted in information input area 3a as it is shown in drawing 16 , although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, "I=I1" will be shown, when the directions member 61 is inserted in information input area 3a and recursive light reaches a photo detector 75. Thus, the part whose optical reinforcement is "I=I1" is a peak. In addition, among drawing 16 , time amount t=t0 is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.

[0116] Therefore, in the time amount t from which optical reinforcement became "I=I1", if it is t1, the outgoing radiation include angle theta of the beam light in which retroreflection was carried out by the directions member 61 inserted in the information input area 63 is computed as theta=omega (t1-t0) = omega**t. That is, the outgoing radiation include angle theta (thetanL, thetanR) of the beam light in which retroreflection was carried out by the directions member 61 inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member 61 by the technique of triangulation based on those outgoing radiation include angles theta (thetanL, thetanR) will be computed.

[0117] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0118] And according to such coordinate input unit 3D, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0119] E. Explain the 5th coordinate input unit, next coordinate input unit of ** 5th 3E based on drawing 17 - drawing 18 . This 5th coordinate input unit 3E is the so-called coordinate input unit of the camera image pick-up method which incorporates the image information in an information input area with an image pick-up camera, and detects a position coordinate based on the part of that incorporated

image information.
[0120] Here, drawing 17 is the front view showing roughly the configuration of 5th coordinate input unit 3E. The image pick-up camera 82 which is an image pick-up means separates distance w in the upper part both ends of information input area 3a in 5th coordinate input unit 3E, and is formed in them. The photo detector 83 and the image formation optical lens 84 which are CCD (Charge Coupled Device) separate distance f to the image pick-up camera 82, and are prepared in it. The image pick-up field angle of these image pick-up cameras 82 is about 90 degrees, and it is installed, respectively so that information input area 3a may be made into photographic coverage. Moreover, the image pick-up camera 82 is installed so that it may become a predetermined distance from screen 2a of PDP2 which forms a coordinate input screen, and the optical axis is parallel to screen 2a of PDP2.
[0121] In addition, it is the periphery section except the upper part of information input area 3a, and the whole photography visual field is prepared in the background plate 85 in the wrap location, without barring the image pick-up field angle of the image pick-up camera 82. This background plate 85 turns that field in the center of information input area 3a, and is formed in an abbreviation perpendicular to screen 2a of PDP2. Let this background plate 85 be uniform black, for example.
[0122] The signal of the image pick-up camera 82 and relation with the directions member P are shown in drawing 18 . As shown in drawing 18 , when the directions member P is inserted in information input area 3a, the directions member P is photoed by the image pick-up camera 82, and the image of the directions member P is formed on the photo detector 83 of the image pick-up camera 82. In the background plate 85 is black like 5th coordinate input unit 3E and using a finger as a directions member P, since the directions member P will have a high reflection factor compared with the background plate 85, the part equivalent to the directions member P of a photo detector 83 serves as a field (bright point) where optical reinforcement is strong.
[0123] Since it is technically well-known about the electrical installation of each part, detailed explanation is omitted, but as shown in drawing 18 , when the directions member P is inserted in information input area 3a, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 83. The location Dn where this peak appears supports include-angle thetan of the appearance of the directions member P from the principal point of the image formation optical lens 84, and thetan can express it as thetan=arctan (Dn/f) as a function of Dn. That is, the position coordinate (x y) of the directions member P will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A which mentioned above also in 5th coordinate input unit 3E of such a camera image pick-up method.
[0124] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.
[0125] In addition, as a directions member P, exclusive Penn with a light emitting device to whom self emits light can apply.
[0126] And according to such 5th coordinate input unit 3E, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.
[0127] Then, the explanation is omitted about the processing currently performed by the conventional information input/output system among the processings in the drawing software which is one of the various application programs 24 performed in the information input/output system 1 of the gestalt of this operation, and the same processing, and the function relevant to the features-function with which the information input/output system 1 is equipped is explained below.
[0128] As shown in drawing 19 , in drawing software, the tool bars 91 and 92 which enable actuation of the various functions by the user are displayed. And if it points to the location where the icon 93 contained in these tool bars 91 and 92 is displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of that location and it will click on an icon 93, various actuation is attained.
[0129] Screen 2a is a big screen, such as 40 inches or 50 inches. However, moreover, the tool bars 91 and 92 Since it displays on the upper and lower sides of screen 2a, or an edge on either side, usually, User M Compromise to the location where the desired icon 93 is displayed, or [lengthening the limbs greatly one by one, in order to click on an icon 93] Or it is necessary to start specially, whenever it

clicks on an icon 93, in sitting on a chair and operating it, and actuation is complicated.
[0130] So, in drawing software, various kinds of processings in which it explains below are performed, and operability is raised. That is, drawing software displays various actuation images on screen 2a corresponding to a user performing various actuation on screen 2a with a finger etc.
[0131] Here, an actuation image is a graphic form displayed on a screen, and when a user performs predetermined actuation with a finger etc. to that graphic form, it receives that a user performs various actuation (various actuation concerning drawing software at this example) to the information input/output system 1.
[0132] That is, a user detects the difference in the actuation performed on screen 2a using a finger etc., displays a different actuation image for the actuation of every on screen 2a, and receives various actuation from a user through the displayed actuation image.
[0133] Drawing 20 is an explained flow chart which takes lessons from this processing one example. As shown in drawing 20 , when the coordinate input unit 3 detects having pointed to 2 on screen 2a, and Points Pa and Pb (referring to drawing 21) to coincidence with the finger etc. (Y of step S1), Or the coordinate input unit 3 detects having pointed to 1 on screen 2a, and Point Pa (Y of step S2). With the condition of having pointed within fixed time amount T set up beforehand after this detection to (N of step S3), and Point Pa (referring to drawing 21), When the coordinate input unit 3 detects what coincidence pointed to other points Pb (refer to drawing 21), (Y of step S4), The distance of the coordinate location of the Point Pa and Point Pb which were detected is computed (step S5). When the distance is below the distance d set up beforehand, (Y of step S6), The icon 94 (refer to drawing 22) as an example of the actuation image contained in the drawing software beforehand stored in the hard disk 1 among the various icons 93 currently used with this drawing software is displayed on the predetermined field to which it is beforehand set up near the point Pb (step S7). Step S7 has realized an actuation image display means and actuation image display processing. step S3 -- a time check -- a means and a time check -- processing, the 1st comparison means, and 1st comparison processing are realized. Step S5 realizes a ranging means and ranging processing, and step S6 has realized the 2nd comparison means and 2nd comparison processing.
[0134] The example of drawing 22 shows the example which displays three, Rhine tool icon 94a, eraser icon 94b, and stamp icon 94c, on coincidence as an icon 94. If it points to the location where the icon 94 is displayed like the icon 94 if these icons 94 are displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of the location and it will click on an icon 94, various actuation is attained.
[0135] for example, the icon of the function in which Rhine tool icon 94a is the icon of the function which draws Rhine on screen 2a, and eraser icon 94b eliminates the image on screen 2a in the example of an icon 94 shown in drawing 22 -- it is -- stamp icon 94c -- "secrecy" -- it is the icon of the function which displays which "secret" alphabetic character and "secret" mark on screen 2a. If it explains more concretely, by clicking Rhine tool icon 94a, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the finger etc., and Rhine can be displayed on the locus. Moreover, by clicking eraser icon 94b, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the finger etc., and the image on the locus can be eliminated. furthermore, the location directed with the finger on screen 2a etc. by clicking stamp icon 94c -- "secrecy" -- which "secret" alphabetic character and "secret" mark can be displayed.
[0136] Thus, since the predetermined icon 94 can be displayed on the location where it is beforehand set up near the point Pb by pointing to two points and Points Pa and Pb to coincidence with a finger etc. Compromise to the location where the desired icon 94 is displayed, or [lengthening the limbs greatly one by one, in order that User M may click on an icon 94] or -- starting specially, whenever it clicks on an icon 94, in sitting on a chair and operating it **** -- etc. -- even if it does not perform troublesome actuation, an icon 94 can be displayed at hand and operability can be improved.
[0137] In order to display an icon 94, only when it points to two points of screen 2a to coincidence with a finger etc., (Y of step S1, Y of S2, Y of S4), The case where the locus traced with the finger etc. by the function of Rhine tool icon 94a is indicated by Rhine since an icon 94 is displayed (step S7), It is easily

distinguished from the case where it points to one on screen 2a, like [in the case of eliminating the image on the locus traced with the finger etc. by the function of eraser icon 94b].
[0138] Moreover, if a certain amount of time amount is vacated and it is made to point to two on screen 2a, since an icon 94 is displayed, the case where place the extent time difference which is the purpose of an except, and it points to two points is distinguishable, since it is necessary to point to two points and Points Pa and Pb within fixed time amount T at coincidence (N of step S3).
[0139] Furthermore, if distance d is set as the distance usually considered that it may point with two fingers of one hand, since an icon 94 is displayed, the case where keep the extent distance which is the purpose of an except and it points to two points is distinguishable, since an icon 94 is not displayed unless the distance during Points Pa and Pb is below the distance d (Y of step S6).
[0140] In addition, the class of icon displayed as an icon 94 and a number, a display position (the exception of the location on the basis of any of Points Pa and Pb, Point Pa or the distance from Pb, a direction, range), etc. can be beforehand set up on the actuation screen displayed on screen 2a. This realizes a reception means and reception processing. And if this setup is made, the contents of the aforementioned predetermined table will be updated in the class of icon 94 after a setup and a number, and a display position, and an icon 94 will be henceforth displayed according to those contents. This realizes an updating means and an update process.
[0141] In this case, these items can also be registered into a table for every user according to individual. And discernment of each user can be performed using various authentication techniques. For example, or it inputs a user's name and ID on screen 2a (or it chooses), it is reading a user's fingerprint and collating this with a registered fingerprint beforehand etc. (for details, see a JP,2000-187419,A official report, the JP,2000-187420,A official report, etc., for example). Furthermore, when Points Pa and Pb are in the upper limit side on screen 2a, an icon 94 is displayed on the bottom, when it is in a lower limit side at the bottom, and when Points Pa and Pb are in the right end side on screen 2a, an icon 94 can be displayed on left-hand side on right-hand side, when it is in a left end side.
[0142] When it points to three or more on screen 2a, you may make it display an icon 94, although he is trying to display an icon 94 in the aforementioned example when it points to two points of Points Pa and Pb on screen 2a. In this case, you may make it change the class of icon 94 to display by to what point it pointed. By this, when it points to two points for example, on screen 2a, the highest icon 94 of operating frequency is displayed for a user. it is alike, and since it follows, the thing whose it increases with three points and four points and for which the icon 94 with low operating frequency is displayed one by one becomes possible, the class of icon 94 which carries out a finger and comes out of and which can be displayed is increased and the display can be changed easily, operability can be raised further.
[0143] By the way, in order to perform such processing, it is necessary to enable it to detect to coincidence the coordinate of two points (points Pa and Pb) to which it pointed on screen 2a. Then, the technique for detecting the coordinate of Points Pa and Pb to coincidence is also explained using the coordinate input unit 3 mentioned above.
[0144] That is, when coordinate input unit 3A of a recursive light electric shielding method was explained to the example and the directions members A and B are inserted into information input area 3a at coincidence as shown in drawing 23 , the field (scotoma) where the optical reinforcement of two places is weak is because it is generated, respectively on CCD (photo detector)39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). that is, since the position coordinate was computed as a function of XnLXnR as mentioned above, when two directions members A and B are inserted into information input area 3a at coincidence While the include angle thetaR2 of an include angle thetaR1, and the directions member B and right-hand side optical unit 27R of the directions member A and right-hand side optical unit 27R to make to make is computed The include angle thetaL2 of an include angle thetaL1, and the directions member B and left-hand side optical unit 27L of the directions member A and left-hand side optical unit 27L to make to make will be computed, and a total of four position coordinates will be computed.
[0145] However, even if it is the case where a total of four position coordinates are computed by two directions members in this way by the inside of information input area 3a having been directed to

coincidence, it is possible to detect the position coordinate directed by two directions members. Real-image judging processing in which the position coordinate of the actual covering point (reflective spot) by two or more directions members is judged out of two or more position coordinates computed below is explained.

[0146] The flow chart which shows roughly the flow of the processing in which drawing 24 includes real-image judging processing here, and drawing 25 are the explanatory views showing the condition that two or more position coordinates which can be set to information input unit 3A are computed. In addition, in drawing 21 , the coordinate locus of a real image which directed "A1, A2, A3, A4" by one directions member, and "B1, B-2, B3, B4" show the coordinate locus of the real image directed by the directions member of another side. Moreover, "C1, C2, C3, C4", and "D1, D2, D3, D4" are virtual images.

[0147] In the gestalt of this operation, calculation of a coordinate judges first whether a calculation coordinate is five or more (step S14 shown in drawing 24). Since directions members, such as (Y of step S14 shown in drawing 24), three or more fingers, and Penn, are inserted into information input area 3a at coincidence when a calculation coordinate is five or more, future decision is not performed.

[0148] On the other hand, when a calculation coordinate is not five or more, in continuing step S15, it is judged from the directions member inserted into (N of step S14 shown in drawing 24) information input area 3a being one or two whether the number of calculation coordinates is one.

[0149] For example, since the number of calculation coordinates is not one when two directions members are inserted into information input area 3a at coincidence and four position coordinates (A1, B1, C1, D1 which are shown in drawing 25) are computed (N of step S15), coordinate extract processing in which the position coordinate of the actual covering point by two or more directions members is extracted out of two or more position coordinates is performed. In addition, although not illustrated especially, when 1 receives optical unit 27 when two directions members are inserted into information input area 3a at coincidence and the insertion point is located in a line on a straight line, the number of the position coordinates computed is two.

[0150] As coordinate extract processing, two or more computed position coordinates (A1, B1, C1, D1) are first memorized in the memory of RAM14 grade (step S16).

[0151] In continuing step S17, it is judged whether there is any position coordinate decided as a real image among two or more position coordinates (A1, B1, C1, D1) recorded on memory.

[0152] When there is no position coordinate decided as a real image, it progresses to (N of step S17), and step S18, and it judges whether the calculation coordinate required for a real-image judging for multiple times acquired one by one serially is memorized by memory.

[0153] When the calculation coordinate for multiple times is memorized by memory, after setting up the initial criteria (experimental value) of (Y of step S18) vector length, displacement length, and the displacement direction (step S19), it progresses to step S20 and real-image judging processing is performed.

[0154] Here, drawing 26 is a flow chart which shows the flow of real-image judging processing roughly. As shown in drawing 26 , first, in step S51, real-image judging processing makes a predetermined calculation coordinate an origin coordinate, computes the coordinate vector value and coordinate vector length between coordinates, and memorizes them in the memory of RAM14 grade for every sampled position coordinate.

[0155] Here, the calculation approach of a coordinate vector value is explained with reference to drawing 27 . In drawing 27 , the position coordinate which was able to acquire the position coordinate detected last time (X1, Y1), and this time is set to (X2, Y2). A coordinate vector value is computed by delta Y/delta X from variation deltaX=X2-X1 of the direction of X coordinate, and variation deltaY=Y2-Y1 of the direction of Y coordinate. From X shaft orientations, the coordinate vector value in this case is evaluated at intervals of 10 degrees by the vector table TB stored in RAM42 shown in drawing 28 , and is beforehand stored in it. In addition, what is necessary is just to set this spacing (10 degrees) as arbitration. Moreover, the approximate value of a calculation result shall be used for a coordinate vector value. For example, it will be set to coordinate vector value =24 if it is the case of

delta Y/delta X= 0.900 in -deltaY and -deltaX.
[0156] Moreover, if the coordinate vector value between the coordinates in each sampling is computed as mentioned above as drawing 27 is shown, and the coordinate vector length L between each coordinate is a coordinate (X1, Y1) and the coordinate vector length L1 of a between (X2, Y2), it is L1=root {(Y2-Y1) 2+(X2-X1) 2}.
It is alike and is computed more. Thus, the coordinate vector value and its coordinate vector length are computed for every sampled position coordinate, respectively.
[0157] That is, in step S51, processing formed into a vector coordinate using the vector data by which setting storing is carried out beforehand to a vector table TB about the length which indicates a part for the change to be the direction where it changes between the position coordinates acquired one by one serially is performed.
[0158] Then, it progresses to step S52 and it is judged whether the coordinate vector length which computed at step S51 is unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period (predetermined time interval accompanying a sampling signal). In addition, the coordinate detection period in the gestalt of this operation is set to 20ms. That is, since step S52 cannot be moved in fact when the coordinate vector length which computed at step S51 is longer than the die length detected in a coordinate detection period (20ms), the coordinate locus judges it to be what is unusual coordinate vector length (abnormality vector length), and is not a real-image locus.
[0159] When coordinate vector length is abnormality vector length, (Y of step S52), Progress to step S53 and it is judged whether the number of position coordinates as which the number of the coordinate vector length which judged abnormality vector length was detected was reached. If the detected number of position coordinates is not reached (N of step S53), a terminal position coordinate is changed (step S54), and the coordinate vector value based on the terminal point and coordinate vector length are again computed in step S51.
[0160] That is, processing of steps S51-S52 is repeated until it is judged with coordinate vector length not being abnormality vector length (N of step S52), or until it is judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length (Y of step S53).
[0161] If the case where followed, for example, a position coordinate A1 is made into an origin coordinate is explained The position coordinate computed just behind that as shown in drawing 25 from it being A2, B-2, and C2 and D2 One position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A1 ->A2, A1 ->B-2, A1 ->C2, and A1 ->D2, the coordinate vector value (origin vector value) concerning one, and its coordinate vector length (origin vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.
[0162] In addition, since (Y of step S53) and decision of a real image can be performed when judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length, it progresses to step S21 mentioned later.
[0163] On the other hand, when judged with coordinate vector length not being abnormality vector length, (N of step S52) and the position coordinate of the terminal point are memorized in the memory of RAM14 grade (step S55), and predetermined initialization (n= 3 (n: count of a coordinate detection period)) is performed (step S56).
[0164] In continuing step S57, the position coordinate of the terminal point of the origin vector memorized in memory in step S55 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected in the n-th coordinate detection period are computed, and it memorizes in the memory of RAM14 grade.
[0165] Then, it progresses to step S58 and the coordinate vector length which computed at step S57 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.
[0166] When judged with coordinate vector length not being abnormality vector length, (N of step S58), It progresses to step S59 and the coordinate locus of A1 ->A2 and the coordinate locus of A2 ->A3

which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).
[0167] Thus, a coordinate vector value being in the specific amount of displacement (V), and judging whether it is the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [coordinate vector length] (L) As shown in drawing 29 , in drawing a straight line generally Although a coordinate vector value changes when drawing a curve, although the coordinate vector length within a coordinate vector value and the same time amount is almost the same and not being illustrated especially, variation is abbreviation identitas and originates in coordinate vector length serving as abbreviation identitas. That is, when a detection object moves onto a straight line or a curve, since it is not generated, the big difference to coordinate vector length and a coordinate vector value is eliminated about the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [coordinate vector length] (L), even if a coordinate vector value is in the specific amount of displacement (V).
[0168] abnormalities -- a variation rate -- the coordinate locus of A1 ->A2 and the coordinate locus of A2 ->A3 which it should progress to (N of step S59), and step S60, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [a coordinate vector value] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.
[0169] Thus, judging whether it is the locus (abnormalities a variation rate direction) on which a coordinate vector value is out of the specific amount of displacement (V), and coordinate vector length is decreasing As shown in drawing 30 , in changing the direction of a straight line a lot and drawing it generally Since the writing speed to turn will carry out sequential reduction, will be in a idle state in the direction commutation point and will begin to be again drawn in the conversion direction at the rate of usual, when a coordinate vector value changes a lot, coordinate vector length originates in increasing toward the conversion direction, after decreasing serially. That is, when a detection object changes a direction a lot, since a idle state of operation occurs just before, even if coordinate vector length is decreasing, it eliminates about the locus (abnormalities a variation rate direction) whose coordinate vector value is outside the specific amount of displacement (V).
[0170] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S60) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate -- the case where it is not a direction, either -- the position coordinate of the terminal point -- the memory of RAM14 grade -- memorizing (step S61) -- the count n of a coordinate detection period -- "1" -- it increments (step S62).
[0171] Then, it is judged whether in step S63, the number of the calculation coordinates for multiple times (judgment coordinate number) which needs the count n of a coordinate detection period for the real-image judging memorized by memory and which is obtained one by one serially was exceeded. When the count n of a coordinate detection period is not over the judgment coordinate number, (Y of step S63) and the continuation vector mentioned above are made into an origin vector (step S64), and in step S57, the coordinate vector value based on the terminal point and coordinate vector length are computed again.
[0172] That is, a terminal position coordinate is changed (step S66), and processing of steps S57-S64 is repeated until the position coordinate of all terminal points is judged with their being abnormality vector length, abnormality displacement length, or the abnormality displacement direction (Y of step S65).
[0173] and -- the position coordinate of all terminal points -- abnormality vector length or abnormalities -- a variation rate -- merit or abnormalities -- a variation rate -- when judged with it being a direction, (Y of step S65), the coordinate vector value based on [in / progress to step S54 again, change a terminal position coordinate, and / step S51] the terminal point, and coordinate vector length are computed.
[0174] The position coordinate of the terminal point of the origin vector which followed, for example, was memorized in memory in step S55 is A2. When A1 ->A2 shall be a real-image locus, the position coordinate computed just behind that as shown in drawing 25 from it being A3, and B3, C3 and D3 One

position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A2 ->A3, A2 ->B3, A2 ->C3, and A2 ->D3, the coordinate vector value (continuation vector value) concerning one, and its coordinate vector length (continuation vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.

[0175] Since it means that (Y of step S63) and a real image were decided on the other hand when judged with the count n of a coordinate detection period having exceeded the judgment coordinate number, the position coordinate will be transmitted to a computer 5 through an interface 43 (step S67), and it will use for processing of the display of the directions location by the directions member, the command input corresponding to a directions location, etc.

[0176] Here, the judgment of being a real image about other position coordinates based on the position coordinate of 1 is explained with reference to drawing 23 . If each A and A' of the judgment of being a real image about other position coordinates based on the position coordinate of 1 shall be a real image in drawing 23 , a coordinate will be detected in the direction of **. For this reason, it turns out that either of A and A' is a real image. Moreover, it turns out similarly that either of B and B' is a real image. That is, only either of the position coordinate which exists in the same direction is a real image, and another side will be a virtual image. Moreover, since B' of the ** direction will also be recognized as a virtual image while A' of another side is recognized as a virtual image when it turns out that one A is a real image, it turns out that B is a real image. That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, it turns out that the judgment of the real image about all position coordinates or a virtual image is possible. Therefore, since it is necessary to perform a real-image judging about no computed position coordinates, it becomes possible to detect the position coordinate at the time of directing two or more places to coincidence by low cost.

[0177] In addition, as shown in drawing 31 , when the position coordinate (it sets to drawing 31 and is B1) of one exists out of information input area 3a among two or more position coordinates (A1, B1, C1, D1) memorized by memory, A1 and C1 can be decided as a real image.

[0178] That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, according to the judgment of the real image about all position coordinates or a virtual image being possible, it will decide as a real image (step S68), and the position coordinate of another side will also be transmitted to a computer 5 through an interface 43 (step S69). Moreover, processing of steps S67-S69 is repeated until it decides about all judgment coordinate numbers (Y of step S70). And when transmission of the position coordinate of the real image about all judgment coordinate numbers is completed, it ends and (Y of step S70) and real-image judging processing return to step S14.

[0179] Next, the processing at the time of being judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length in step S53 is explained. Although it progresses to step S21 as (Y of step S53), and a thing which cannot perform decision of a real image as mentioned above when judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length, in this step S21, it judges whether there is any paddle which is still performing real-image judging processing about the position coordinate (for example, C1 [on drawing 25 and as opposed to A1]) of the same direction. When real-image judging processing about the position coordinate of the same direction has not been performed yet, (N of step S21) and an origin coordinate are changed (step S22), and it progresses to step S20 again, and real-image judging processing is performed. On the other hand, when real-image judging processing about the position coordinate of the same direction is being performed, (Y of step S21) and the criteria of the vector length, displacement length, and the displacement direction set up at step S19 are changed (step S23), it progresses to step S20 again, and real-image judging processing is performed. That is, a real-image judging will be repeated on these conditions by turns about the position coordinate of two points of the same direction.

[0180] Moreover, when the number of the computed position coordinates is one, while transmitting (Y

of step S15), and its computed position coordinate to a computer 5 through an interface 43 (step S24), it memorizes in the memory of RAM14 grade (step S25), and returns to step S14.
[0181] Next, in step S17, the case where it is judged with there being a position coordinate decided as a real image is explained. When there is a position coordinate decided as a real image, it progresses to (Y of step S17), and step S26.
[0182] The case where there is a position coordinate decided as a real image here is a case where two or more storage of the position coordinate in case the position coordinate computed as mentioned above is not plurality is carried out at the memory of RAM14 grade, for example, is a case as shown in drawing 32 . As the directions member of 1 has described drawing 32 , it shows the condition that other directions members were inserted into information input area 3a. In addition, the case where there is a position coordinate decided as a real image cannot be overemphasized by including the case where the coordinate of two points is decided by processing which was mentioned above.
[0183] In step S26, based on the last time of the position coordinate decided as a real image, and the value before last, the coordinate vector value (real-image vector value) and coordinate vector length (real-image vector length) between coordinates are computed, and it memorizes in the memory of RAM14 grade.
[0184] then, vector length and a variation rate -- merit and a variation rate -- after setting up the initial criteria (experimental value) of a direction (step S27), the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected by coincidence are computed, and it memorizes in the memory of RAM14 grade. [two or more]
[0185] Then, it progresses to step S29 and the coordinate vector length which computed at step S28 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.
[0186] When judged with coordinate vector length not being abnormality vector length, (N of step S29), It progresses to step S30 and the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).
[0187] abnormalities -- a variation rate -- the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which it should progress to (N of step S30), and step S31, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [a coordinate vector value] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.
[0188] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S31) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate, in not being a direction, either The position coordinate of the terminal point is memorized in the memory of RAM14 grade (step S32). While transmitting the position coordinate to a computer 5 through an interface 43 (step S33), it decides as a real image (step S34), and the position coordinate of another side is also transmitted to a computer 5 through an interface 43 (step S35).
[0189] the case (Y of step S29) where it is judged with coordinate vector length being abnormality vector length on the other hand -- abnormalities -- a variation rate -- the case (Y of step S30) where it is judged with his being merit -- abnormalities -- a variation rate -- a detection coordinate is changed (step S37) and processing of steps S28-S31 is repeated until it reaches (Y of step S31), and a detection coordinate number (Y of step S36), when judged with it being a direction.
[0190] Therefore, when [for example,] the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is A4, The position coordinate computed just behind that as shown in drawing 32 from their being A, B, C, and D One position coordinate is chosen at a time as a terminal point from these position coordinates (A, B, C, D). Sequential calculation of A4->A, A4->B, A4->C, any of A4->D or the coordinate vector value (locus vector value) concerning one, and its

coordinate vector length (locus vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out. That is, other position coordinates located in the same direction to a photo detector in pursuing the locus of the position coordinate of 1 judged that is a real image are recognized to be a virtual image, and the position coordinate which are other real images is decided.

[0191] Moreover, when a detection coordinate number is reached, (Y of step S36) and the criteria of the vector length, displacement length, and the displacement direction set up at step S27 are changed (step S38), and it progresses to step S28 again, and a coordinate vector value (locus vector value) and its coordinate vector length (locus vector length) are computed.

[0192] Even if it is the case where a total of four position coordinates are computed by two directions members by the above processings by the inside of information input area 3a having been directed to coincidence, the position coordinate directed by two directions members can be detected, and these two position coordinates can be confirmed.

[0193] Next, another example of the actuation image displayed on screen 2a is explained.

[0194] First, as shown in drawing 33 , when it points to coincidence to three on screen 2a, the dial 101 which is an actuation image is displayed on the location where it is beforehand set up near [the] the three points (drawing 33 (a)). The image of this dial 101 is beforehand contained in the drawing software of a hard disk 17. And the location of three points which is pointing on screen 2a is moved, if actuation of turning a dial 101 is carried out, the image of a dial 101 can also be rotated and rotation actuation of the dial 101 can be carried out (drawing 33 (b)). This dial 101 is carrying out rotation actuation, and makes it possible to perform predetermined actuation to the information input/output system 1. It is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1 in this example, since an actuation image is a dial, etc.

[0195] Processing about this dial 101 is specifically performed as follows. Drawing 34 is a flow chart explaining the processing in this case. First, it detects that coincidence points to three on screen 2a (Y of step S71). Although the coordinate of three or more points to which it pointed on screen 2a is undetectable to coincidence in the processing explained below with reference to drawing 23 , it cannot be necessary to specify that exact coordinate of three points in this example that what is necessary is just to be able to detect that coincidence points to three on screen 2a. That is, since a total of nine points of the real image of three points and the virtual image of six points are detected also in the example below drawing 23 when pointing to three on screen 2a, thereby, it is detectable that actually pointing is three points (even if the exact location of three points is undetectable).

[0196] In the example of drawing 35 , 6 point G1-G6 of three-point Pa of a real image, Pb and Pc, and a virtual image are detected. And the coordinate of the middle point C of each of these coordinates Pa (xa, ya), Pb (xb, yb), Pc (xc, yc), G1 (x1, y1)-G6 (x6, y6) of nine points is searched for (step S72).

[0197] namely, -- x0= (xa+xb+xc+x1+x2+x3+x4+x5+x6)/9 y0=
(ya+yb+yc+y1+y2+y3+y4+y5+y6)/9 .... (6)
****** is performed and the coordinate (x0, y0) of the middle point C is searched for.

[0198] And the image of a dial 101 is displayed centering on the location of this middle point C (x0, y0) (step S73).

[0199] And when there is migration of a location, as it is shown in (Y of step S74), and drawing 36 nine-point Pa-Pc and in G1-G6 One point is specified as an observing point nine-point Pa-Pc and in G1-G6 (this example the point Pa), and the nearest detecting point is made into the moving point of an observing point at an observing point in the case of migration of a location (in this example, it displays as point Pa'). The middle point C as a core of a circle Angle-of-rotation thetam of the circle concerned is computed from the observing point Pa (xa, ya) and two points of moving point Pa' (xa', ya') (step S75). Step S74 has realized a migration detection means and migration detection processing.

[0200] That is, migration length L=root(xa' - xa) 2+(ya' - ya) 2 radius r=root(xa-x0) 2+(ya-y0) 2 are calculated (also see drawing 37), and it is angle-of-rotation thetam=(360xL)/(2x pixr) from this result. (However, pi circular constant)

********.

[0201] And according to angle-of-rotation thetam, the image of a dial 101 is rotated and displayed centering on the middle point C (step S76). Steps S73, S75, and S76 have realized an actuation image display means and actuation image display processing. Moreover, actuation according to angle-of-rotation thetam is received and performed (step S77). Step S77 has realized an actuation means and actuation processing. That is, when a dial 101 operates voice volume as mentioned above, voice volume will be operated according to the magnitude of angle-of-rotation thetam. When no longer pointing to three on screen 2a, (Y of step S78) and the display of a dial 101 are eliminated (step S79).

[0202] Another example of the actuation image displayed on screen 2a is explained.

[0203] As shown in drawing 38 , when it points to coincidence to five on screen 2a with five fingers of one hand etc., a door 102 is displayed on the location where it is beforehand set up near [the] the five points (drawing 38 (a)). And if the location of five points to which it pointed as it was is moved below (or upper part), a door 102 will open gradually with migration of the location of five points, and the pallet 103 which is an actuation image will appear under a door 102 (drawing 38 (b)). The image of a door 102 and a pallet 103 is beforehand contained in the drawing software of a hard disk 17. And various actuation can be inputted on a pallet 103 by pointing to one point from which a user differs on a pallet 103, respectively one by one. Since a door 102 is displayed and the pallet 103 which is an actuation image is first displayed on the bottom of a door 102 after that in this example, it is suitable when displaying the actuation image for performing the actuation image which you want to display immediately only by pointing to a screen 2a top, for example, the input which changes a initial value.

[0204] Processing about this pallet 103 is specifically performed as follows. Drawing 39 is a flow chart explaining the processing in this case. First, it detects that coincidence points to five on screen 2a (Y of step S81). Since a total of 25 points of the real image of five points and the virtual image of 20 points are detected when it cannot be necessary to specify the exact coordinate of five points and points to five on screen 2a also in this example, thereby, it is detectable that actually pointing is five points.

[0205] And the same operation as (6) is performed also here, and the coordinate (x0, y0) of the middle point C of a total of 25 points is searched for (step S82). (refer to drawing 40) And the image of a door 102 is displayed on screen 2a centering on the middle point C (step S83). Step S83 has realized a door display means and door display processing.

[0206] Then, although (Y of step S84) and the location of the middle point C are also caudad moved when the location of five points to which the user is pointing is dragged caudad as it was and there is migration of the location of five points, it is not necessarily in agreement with the drag direction. Step S84 has realized a migration detection means and migration detection processing. Since the thing which is the need is the migration length to a lower part, if it sets the coordinate of C point after moving the coordinate of C point before migration (x0, y0) to (x1, y1) By "l=y1-y0", the migration length l to a lower part is found (refer to drawing 41) (step S85), and the image of a door 102 is lowered and displayed only for the migration length l minutes, and a pallet 103 is displayed on the location of the first door 102 (step S86). Step S86 has realized a door modification means, door modification processing, an actuation image display means, and actuation image display processing. It is made for the display of this pallet 103 to be whether a pallet 103 appears gradually from under a door 102 by displaying only the location of a door 102, and the image of a part with which it is not covered.

[0207] And when actuation of a pallet 103 is made, (Y of step S87) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S88), and when termination of a display of a pallet 103 is directed on a pallet 103, the display of (Y of step S89), a door 102, and a pallet 103 is ended (step S90). Step S88 has realized an actuation means and actuation processing.

[0208] Another example of the actuation image displayed on screen 2a is explained.

[0209] As shown in drawing 42 , it is not simultaneous on screen 2a, and when it points to three points to coincidence one by one, the pallet 104 which is an actuation image is displayed on the location where it is beforehand set up near [the] the three points. The image of a pallet 104 is contained in the drawing software stored in the hard disk 17. In this case, a pallet 103 does not appear gradually with the drag of a

door 102 like the above-mentioned example, but since a pallet 104 is what is displayed immediately, it is suitable for the display of the actuation image which you want to display immediately only by pointing to a screen 2a top.

[0210] As shown in drawing 43 , after the processing in this case detects one point (point A) (Y of step S91) (refer to drawing 44), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step (refer to drawing 45) S92). Furthermore, if one point (point C) of an exception is detected, with these two points maintained (Y of step S93) (refer to drawing 46), a pallet 104 will be displayed on the location where it is beforehand set up near these three points (step S94). Step S94 has realized an actuation image display means and actuation image display processing.

[0211] In this case, since it can also perform easily detecting the exact coordinate of three points (points A, B, and C), you may make it determine the display position of a pallet 104 from that exact coordinate of three points, although it may ask for the middle point of the real image of three points, and the virtual image of six points like the above-mentioned and a pallet 104 may be displayed on the location of the predetermined direction of the middle point concerned, and predetermined distance.

[0212] That is, although Points A, B, C, and D will be detected if Point B is directed with the point A directed as shown in drawing 45 , it turns out from the beginning that an A point is a real image (drawing 44). Since Points B and D should not be detected supposing Point C is the real image of the 2nd point, and Points B and C should not be detected supposing Point D is the real image of the 2nd point, a B point is judged to be the real image of the 2nd point. Next, since Points I, F, D, C, and E will not be detected if Point H is the real image of the 3rd point supposing Points A and B are decided as shown in drawing 46 , Point H is judged to be a virtual image. The same decision is repeated and it is judged with Points A, B, and C being real images.

[0213] After the display (step S94) of a pallet 104, when actuation of a pallet 104 is made, (Y of step S95) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S96), and when termination of a display of a pallet 104 is directed on a pallet 104, (Y of step S97) and the display of a pallet 104 are ended (step S98).

[0214] Another example of the actuation image displayed on screen 2a is explained.

[0215] If it points to one point (point Pa) on screen 2a, it points to the 2nd (point Pb) point in this condition and this location of the 2nd point is moved up and down as shown in drawing 47 , the slider bar 105 which is an actuation image will be displayed on the location of the 2nd point to which it is pointing. The image of a slider bar 105 is contained in the drawing software in a hard disk 17. This slider bar 105 as well as the case of a dial 101 is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1, etc.

[0216] As shown in drawing 48 , after the processing in this case detects one point (point A) (Y of step S101) (refer to drawing 49), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S102). Then, when migration of the 2nd (point B) point is detected with the first directions of one point (point A) maintained, it carries out by displaying the image of a slider bar 105 on (Y of step S103), and the location of the 2nd (point B) point (step S104). Step S103 realizes a migration detection means and migration detection processing, and step S104 has realized an actuation image display means and actuation image display processing.

[0217] Detection of the exact coordinate location of Points A and B can be performed using the technique mentioned above below with reference to drawing 23 . Thereby, it can judge with Points A and B being real images among point A-D. and the time of the location of Point B moving -- the coordinate (refer to drawing 49 (x0, y0)) of the location of the original point B -- the coordinate of the location of the point B after migration -- ** (refer to drawing 50 (x1, y1)), if it carries out By "l=y1-y0", since vertical migration length can be found, the image of a slider bar 105 can be displayed on the location which only distance l moved perpendicularly.

[0218] And actuation (adjustment of voice volume etc.) according to the distance l which moved is received and performed (step S105). Step S105 has realized an actuation means and actuation processing. Then, when detection of the two-point coincidence of Points A and B is no longer made, (Y

of step S106) and the display of a slider bar 105 are eliminated (step S107).
[0219] In the above, the example of various actuation images was explained. Next, the processing for judging the exception of these actuation images and displaying a suitable actuation image according to the directions on screen 2a, is explained.
[0220] As shown in drawing 51 , sequential detection of the two points is carried out on screen 2a (Y of step S111), when moving one point detected behind, it shifts to the processing processing described above with reference to (Y of step S112), and drawing 48 (step S113), and a slider bar 105 (refer to drawing 47) is displayed. In this case, when there is no migration of one point detected behind, it shifts to the processing described above with reference to (N of step S112), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.
[0221] Also when two points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S115), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.
[0222] When sequential detection of the three points is carried out on screen 2a, it shifts to the processing described above with reference to (Y of step S116), and drawing 43 (step S117), and a pallet 104 is displayed (refer to drawing 42).
[0223] When three points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S118), and drawing 34 (step S119), and a dial 101 is displayed (refer to drawing 33).
[0224] When five points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S120), and drawing 39 (step S121), and a pallet 103 is displayed (refer to drawing 38). Processing of steps S111-S121 has realized an actuation image display means and actuation image display processing.
[0225] Below, the example of a display of other actuation images is explained briefly.
[0226] As shown in drawing 52 , when it points to two points (points A and B) one by one on screen 2a So that the predetermined object 106 which is an actuation image is displayed, and the distance of these points A and B may be expanded and it may be made to reduce in those two points When moving the location of Points A and B, it responds to the magnitude of the migration length, and it expands and reduces and you may make it display the magnitude of an object 106. An object 106 is the icon 94 mentioned above.
[0227] Drawing 53 is a flow chart in this case. Namely, after detecting one point (point A) (Y of step S131), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S132). When Points A and B are moved, (Y of step S133) and an object 106 are displayed (step S134). Then, the distance la of the beginning of Point A and Point B, A difference with the distance lb after migration is searched for, the range difference lc of the distance la and distance lb is searched for (step S135), and it responds to the magnitude of the range difference lc, and an object 106 is expanded and it reduces (step S136). By step S133, S134 realizes an actuation image display means and actuation image display processing, and step S136 has realized an enlarging-or-contracting means and enlarging-or-contracting processing for a migration detection means and migration detection processing.
[0228] As shown in drawing 54 , when others and three points (points B, C, and D) are detected to coincidence, maintaining this detection of one point after detection of one point (point A), you may make it display a pallet 104, although he is trying to display a pallet 104 in the example mentioned above with reference to drawing 42 - drawing 46 when sequential detection of the points A, B, and C is carried out.
[0229] Furthermore, although a slider bar 105 is displayed on Point B and he is trying for a slider bar 105 to move with migration of Point B in the example mentioned above with reference to drawing 47 - drawing 50 , a slider bar 105 is displayed ranging over Points A and B, and you may make it a slider bar 105 move with vertical migration of Points A and B, as shown in drawing 55 .

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the appearance perspective view showing roughly the information input/output system which is one gestalt of operation of this invention.
[Drawing 2] It is the block diagram showing the electrical installation of each part built in information input/output system.
[Drawing 3] It is the block diagram showing the electrical installation of each part built in a computer.
[Drawing 4] It is the explanatory view showing the configuration of the 1st coordinate input unit roughly.
[Drawing 5] It is the block diagram showing the structure of an optical unit roughly.
[Drawing 6] It is the block block diagram of a controller.
[Drawing 7] It is the front view showing an example which pointed by the directions member to one in the information input area in the 1st coordinate input unit.
[Drawing 8] It is the explanatory view showing detection actuation of CCD typically.
[Drawing 9] It is the perspective view showing the directions member used for the 2nd coordinate input unit.
[Drawing 10] It is the front view showing an example which pointed by the directions member to one in the information input area of the 2nd coordinate input unit.
[Drawing 11] It is the explanatory view showing detection actuation of CCD typically.
[Drawing 12] It is the top view showing roughly the optical unit used for the 3rd coordinate input unit.
[Drawing 13] It is the front view showing an example which pointed by the directions member to one in the information input area of the 3rd coordinate input unit.
[Drawing 14] It is the graph which shows the relation between optical reinforcement and time amount.
[Drawing 15] It is the front view showing an example which pointed by the directions member to one in the information input area of the 4th coordinate input unit.
[Drawing 16] It is the graph which shows the relation between optical reinforcement and time amount.
[Drawing 17] It is the front view showing the configuration of the 5th coordinate input unit roughly.
[Drawing 18] It is an outline front view for explaining the detection actuation.
[Drawing 19] It is an explanatory view explaining the icon actuation using information input/output system.
[Drawing 20] It is a flow chart explaining the processing which information input/output system performs.
[Drawing 21] It is a front view explaining the menu manipulation performed with information input/output system.
[Drawing 22] It is this front view.
[Drawing 23] It is an explanatory view about calculation of two or more position coordinates.
[Drawing 24] It is the flow chart which shows roughly the flow of processing including real-image judging processing.
[Drawing 25] It is an explanatory view about calculation of two or more position coordinates.

[Drawing 26] It is the flow chart which shows the flow of real-image judging processing roughly.
[Drawing 27] It is a vector diagram for explaining the coordinate vector value calculation approach.
[Drawing 28] It is the explanatory view showing a vector table typically.
[Drawing 29] It is the explanatory view showing the motion in the case of drawing a straight line.
[Drawing 30] It is the explanatory view showing the motion in the case of changing the direction of a straight line a lot, and drawing it.
[Drawing 31] It is the explanatory view showing the condition that a real image can be decided automatically.
[Drawing 32] As the directions member of 1 has described, it is the explanatory view showing the condition that other directions members were inserted into the information input area.
[Drawing 33] It is an explanatory view explaining the dial actuation using information input/output system.
[Drawing 34] It is the flow chart of processing of dial actuation.
[Drawing 35] It is an explanatory view explaining the coordinate detection in the case of dial actuation.
[Drawing 36] It is an explanatory view explaining the coordinate detection in the case of dial actuation.
[Drawing 37] It is an explanatory view about the operation performed in the case of dial actuation.
[Drawing 38] It is an explanatory view explaining actuation of the door and pallet using information input/output system.
[Drawing 39] It is a flow chart explaining processing of actuation of a door and a pallet.
[Drawing 40] It is an explanatory view explaining the coordinate detection in the case of actuation of a door and a pallet.
[Drawing 41] It is an explanatory view explaining the operation performed in the case of actuation of a door and a pallet.
[Drawing 42] It is an explanatory view explaining actuation of the pallet using information input/output system.
[Drawing 43] It is a flow chart explaining processing of actuation of a pallet.
[Drawing 44] It is an explanatory view explaining the coordinate detection in the case of actuation of a pallet.
[Drawing 45] It is an explanatory view explaining the coordinate detection in the case of actuation of a pallet.
[Drawing 46] It is an explanatory view explaining the coordinate detection in the case of actuation of a pallet.
[Drawing 47] It is an explanatory view explaining actuation of the slider bar using information input/output system.
[Drawing 48] It is a flow chart explaining processing of actuation of a slider bar.
[Drawing 49] It is an explanatory view explaining the coordinate detection in the case of actuation of a slider bar.
[Drawing 50] It is an explanatory view explaining the coordinate detection in the case of actuation of a slider bar.
[Drawing 51] It is a flow chart explaining selection of an actuation image.
[Drawing 52] It is an explanatory view explaining expansion of the object using information input/output system, and contraction actuation.
[Drawing 53] It is a flow chart explaining expansion of an object, and contraction actuation.
[Drawing 54] It is an explanatory view explaining the display of a pallet.
[Drawing 55] It is an explanatory view explaining the display of a slider bar.
[Description of Notations]
1 Information Input/output System
2 Display
2a Screen
3 Coordinate Input Unit
4 I/O Device

17 Storage
26 Storage
94 Actuation Image, Icon
101 Actuation Image, Dial
102 Door
103 Actuation Image, Pallet
104 Actuation Image, Pallet
105 Actuation Image, Slider Bar
106 Actuation Image

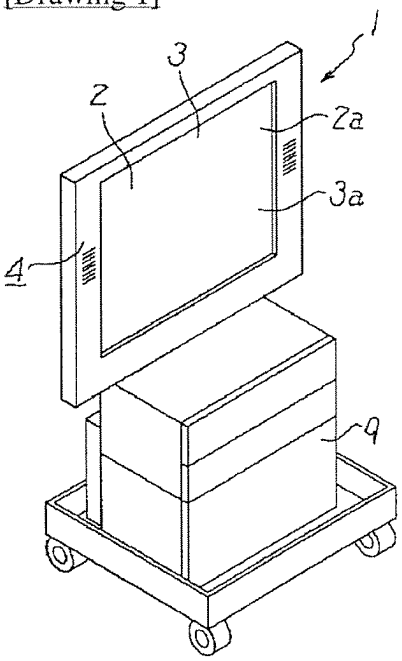
[Translation done.]

* NOTICES *

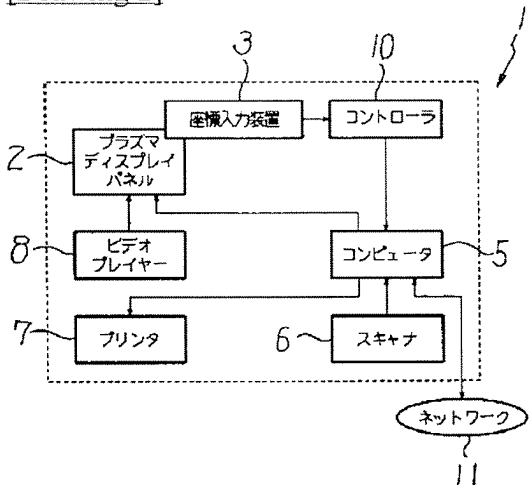
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

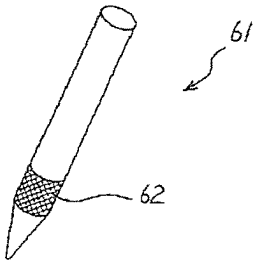
[Drawing 1]



[Drawing 2]



[Drawing 9]



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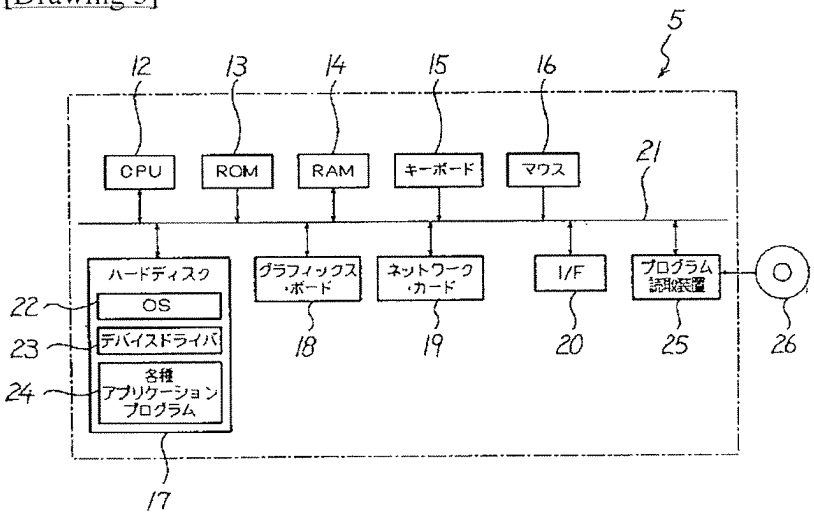

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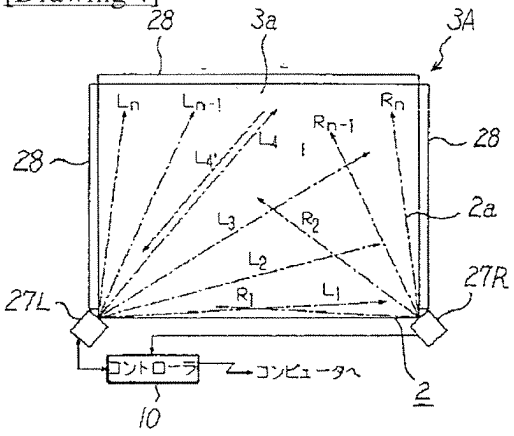

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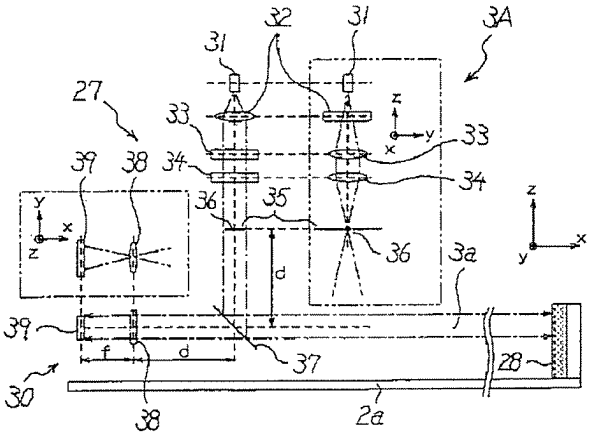
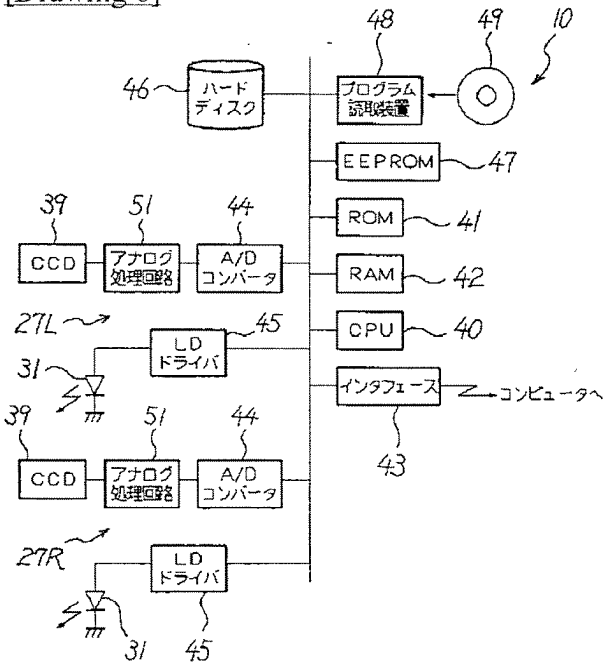


[Drawing 6]



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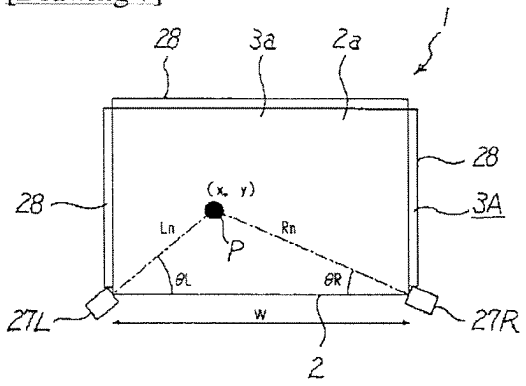

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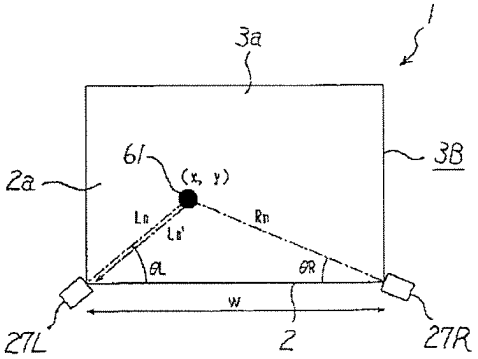

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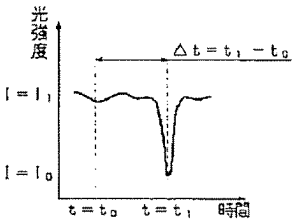

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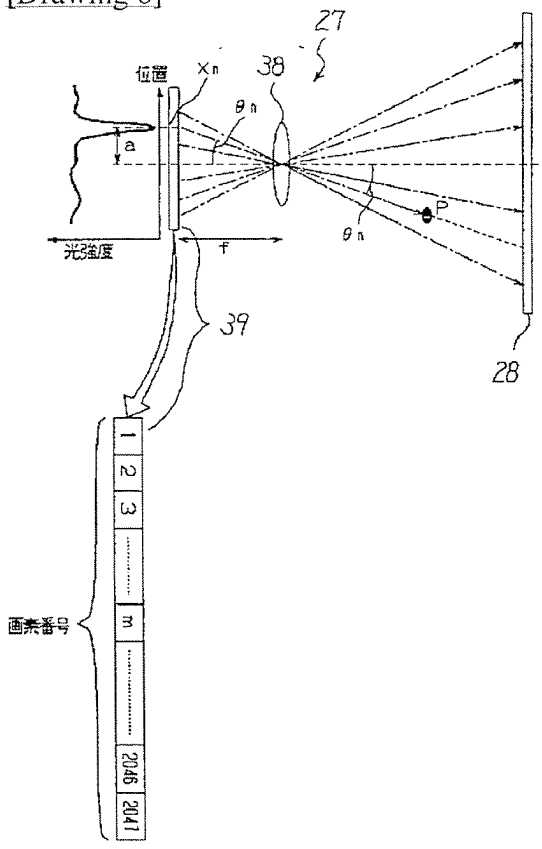

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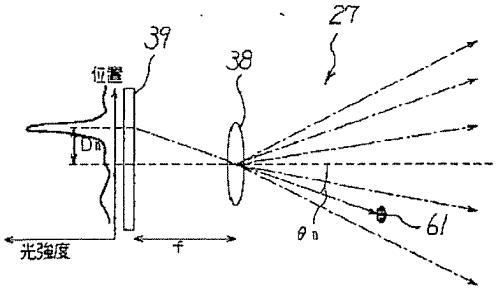

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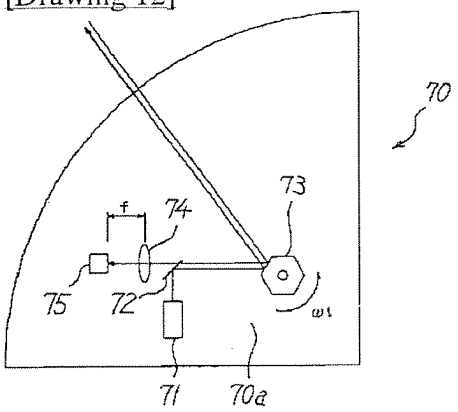

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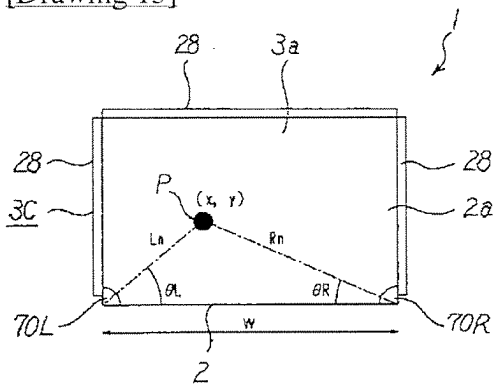

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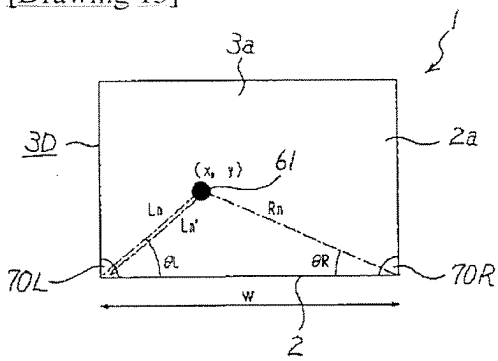

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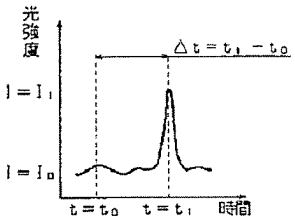

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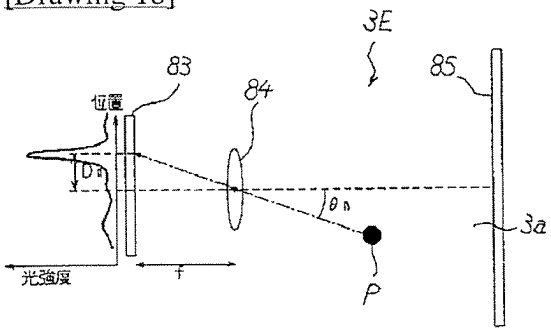

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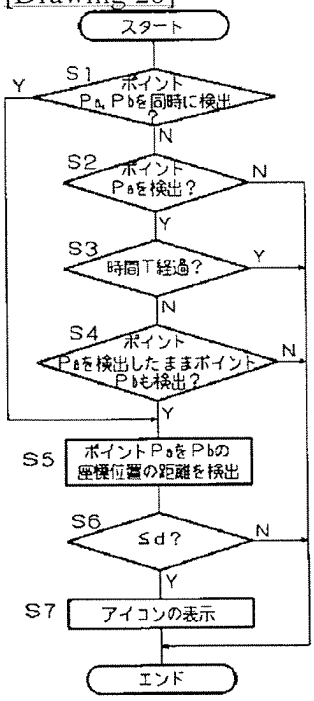

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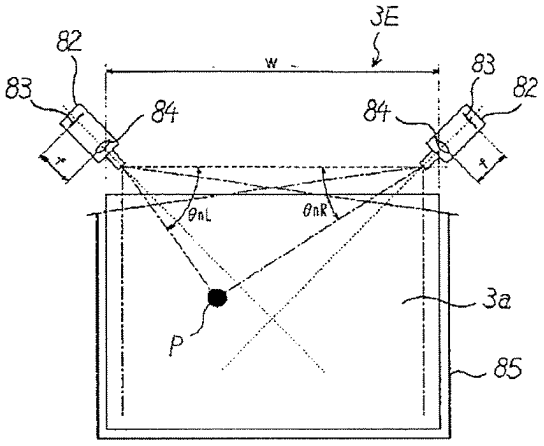

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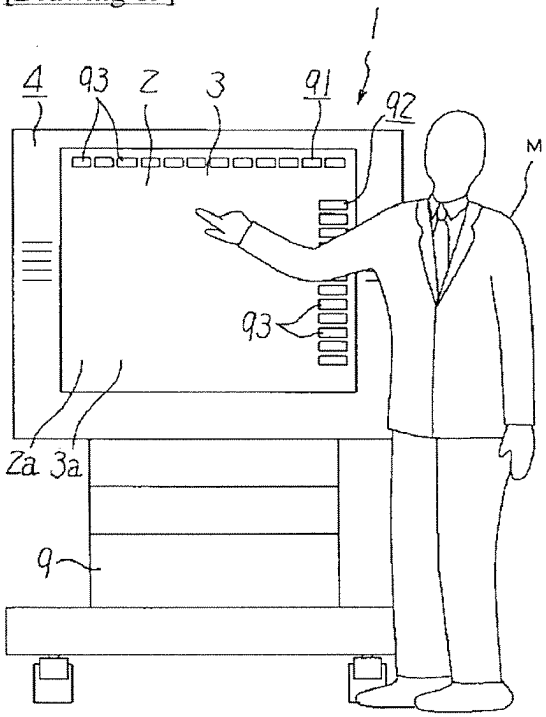

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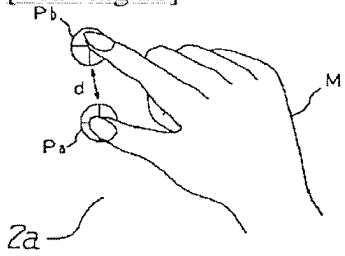

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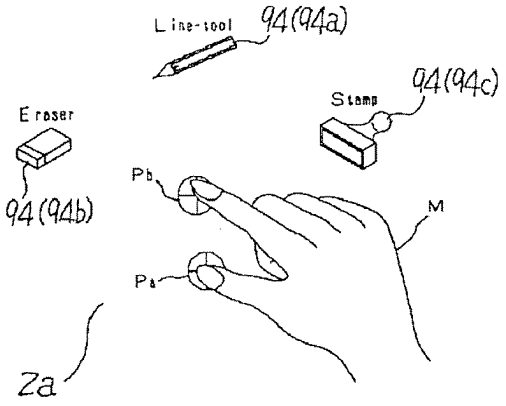

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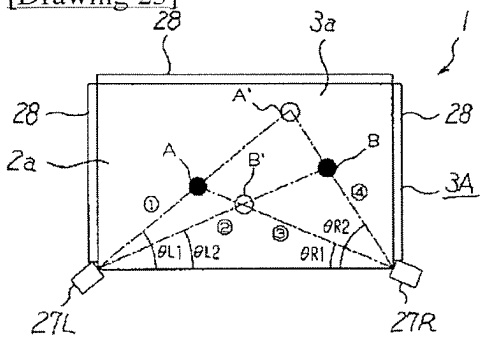

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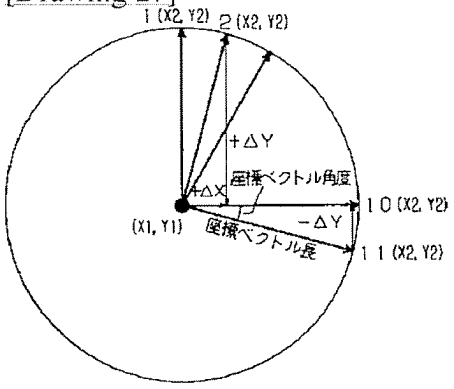

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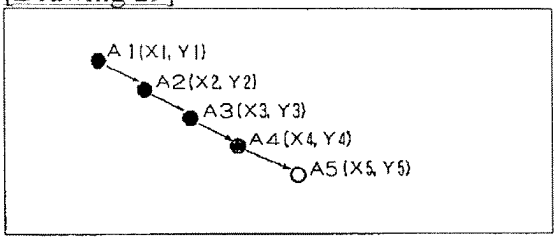

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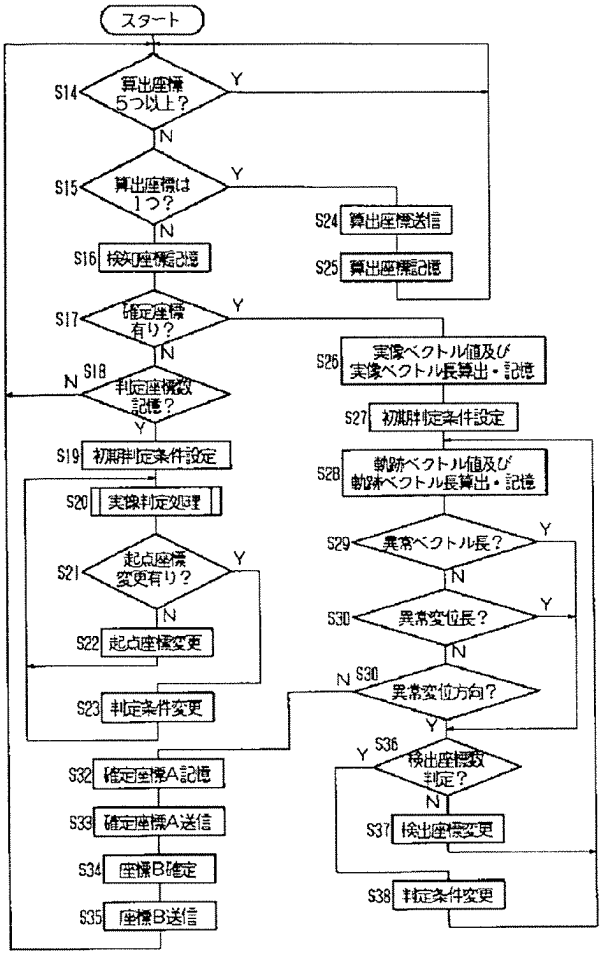

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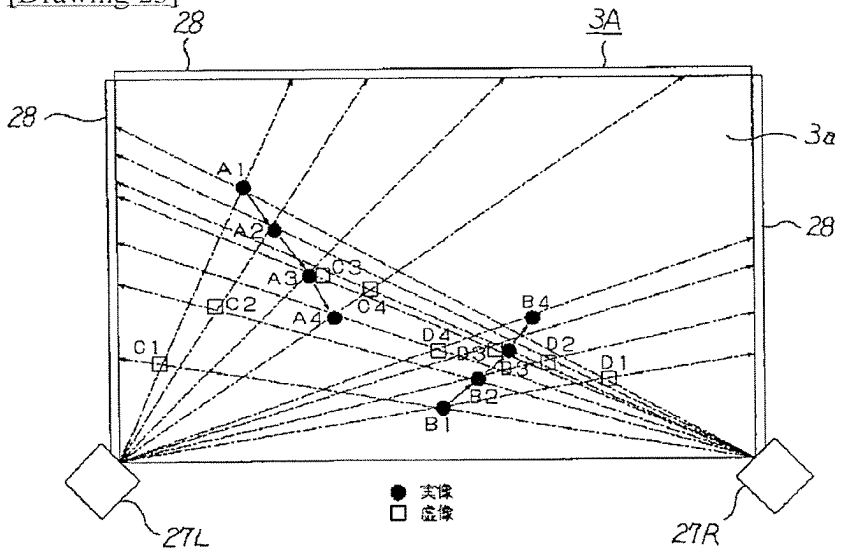

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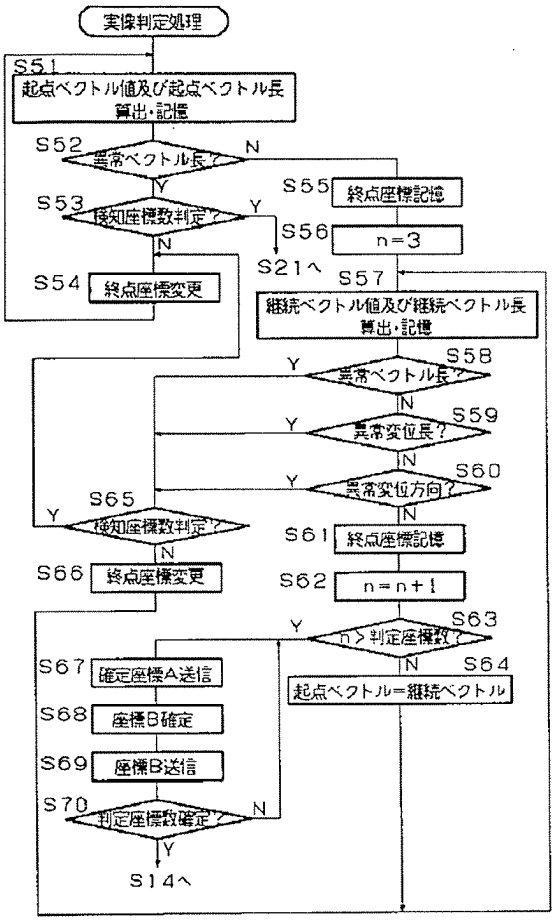

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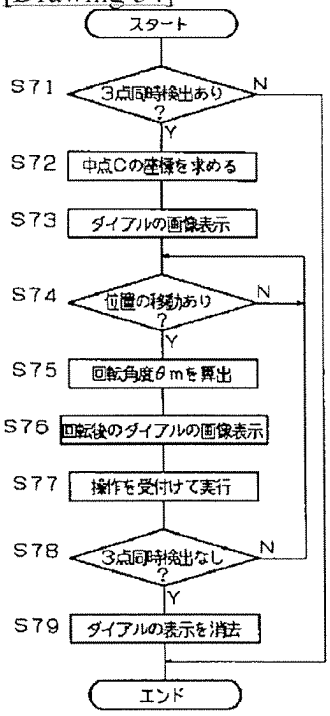
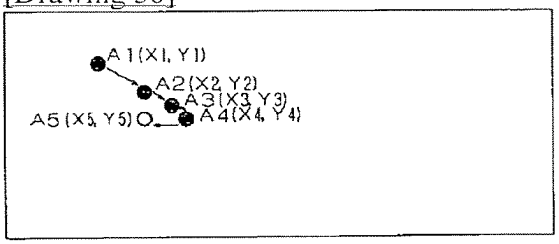


[Drawing 28]

TB

座標ベクトル値	ΔX	ΔY	ΔY/ΔX	座標ベクトル角度
1	0	+	∞ (tan90°)	90°
2	+	+	5.671 (tan80°)	80°
3	+	+	2.747 (tan70°)	70°
4	+	+	1.732 (tan60°)	60°
5	+	+	1.192 (tan50°)	50°
6	+	+	0.839 (tan40°)	40°
7	+	+	0.577 (tan30°)	30°
8	+	+	0.364 (tan20°)	20°
9	+	+	0.176 (tan10°)	10°
10	+	0	0 (tan 0°)	0°
11	+	-	0.176 (tan10°)	10°
12	+	-	0.364 (tan20°)	20°
13	+	-	0.577 (tan30°)	30°
14	+	-	0.839 (tan40°)	40°
15	+	-	1.192 (tan50°)	50°
16	+	-	1.732 (tan60°)	60°
17	+	-	2.747 (tan70°)	70°
18	+	-	5.671 (tan80°)	80°
19	0	-	∞ (tan90°)	90°
20	-	-	5.671 (tan80°)	80°
21	-	-	2.747 (tan70°)	70°
22	-	-	1.732 (tan60°)	60°
23	-	-	1.192 (tan50°)	50°
24	-	-	0.839 (tan40°)	40°
25	-	-	0.577 (tan30°)	30°
26	-	-	0.364 (tan20°)	20°
27	-	-	0.176 (tan10°)	10°
28	-	0	0 (tan 0°)	0°
29	-	+	0.176 (tan10°)	10°
30	-	+	0.364 (tan20°)	20°
31	-	+	0.577 (tan30°)	30°
32	-	+	0.839 (tan40°)	40°
33	-	+	1.192 (tan50°)	50°
34	-	+	1.732 (tan60°)	60°
35	-	+	2.747 (tan70°)	70°
36	-	+	5.671 (tan80°)	80°

[Drawing 30]



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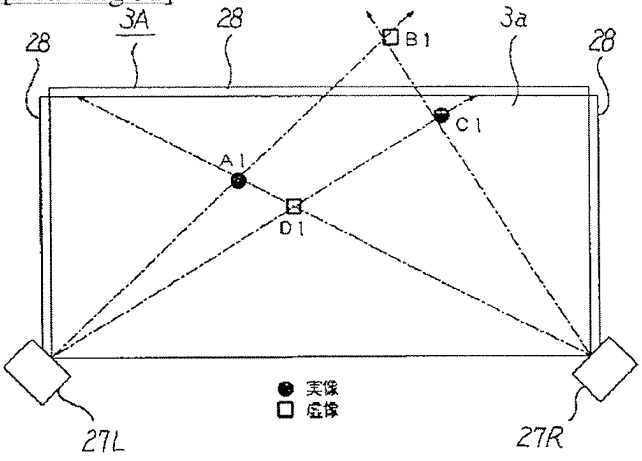
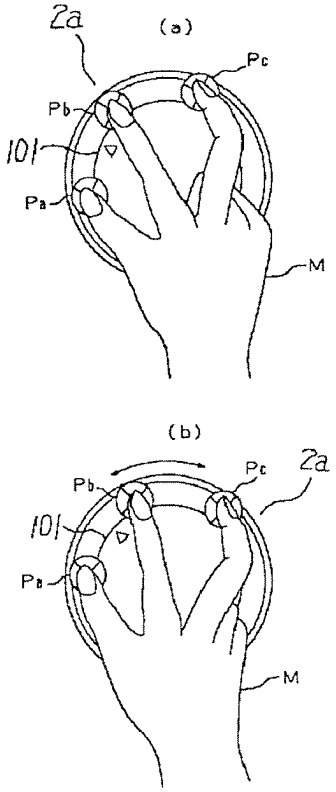


[Drawing 33]



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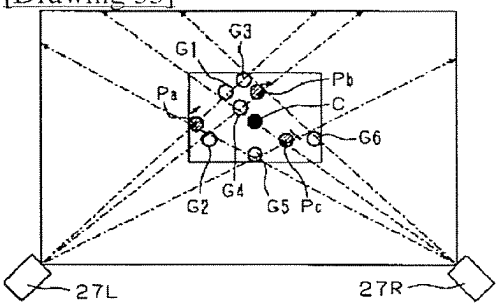

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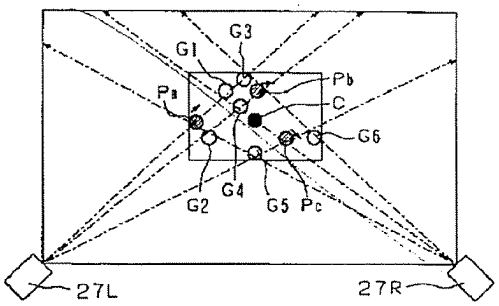

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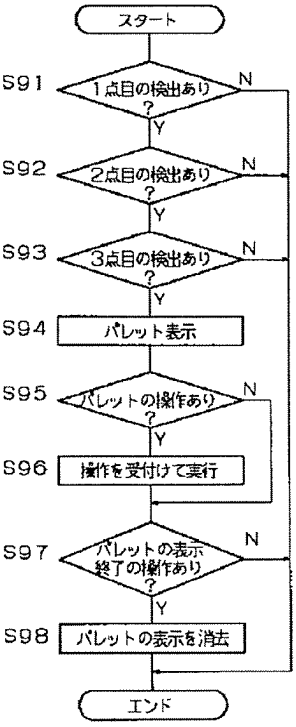

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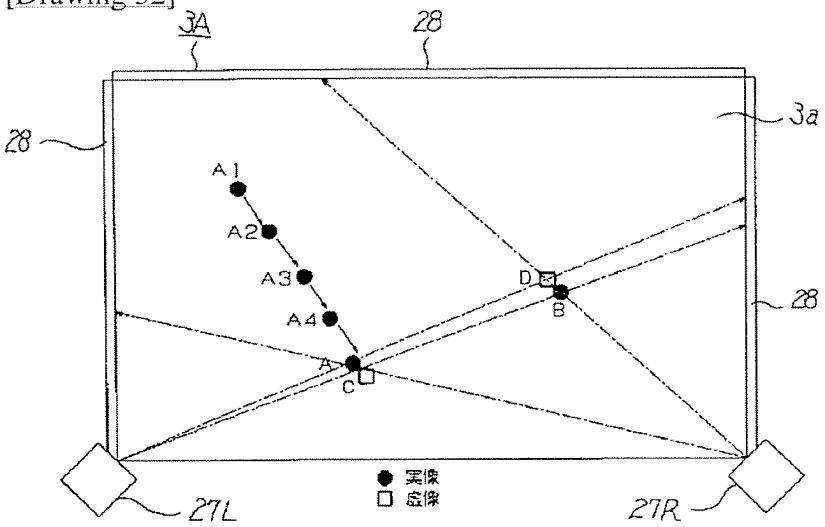

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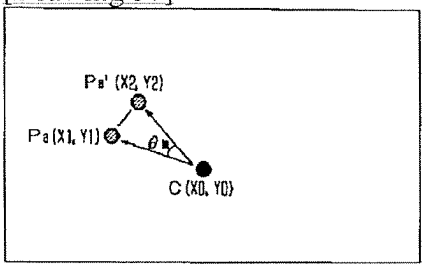

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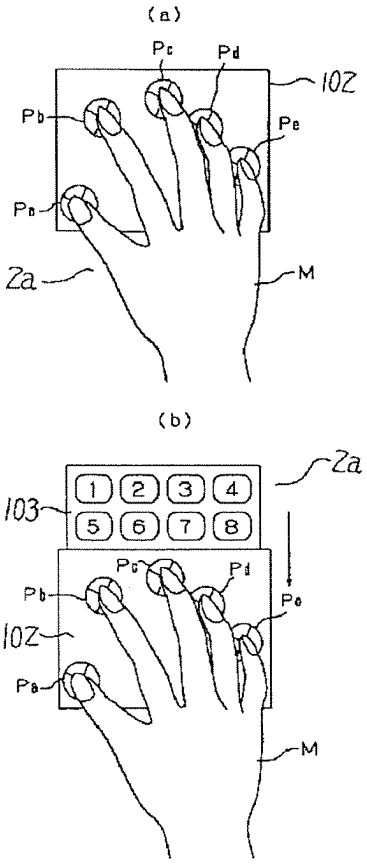
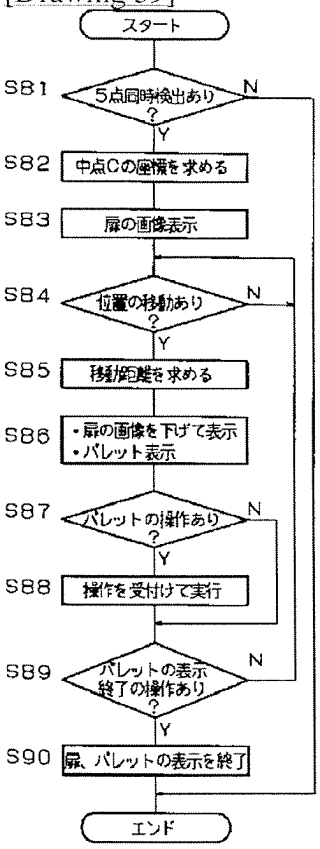
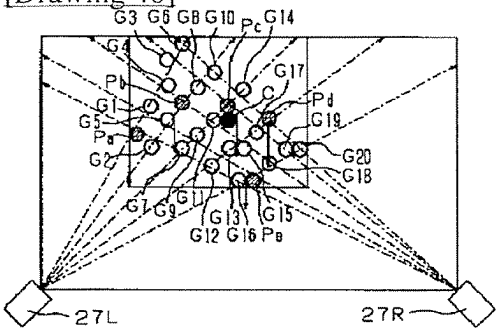

(a)
Pc
Pd
10Z
Pb
Pe
Pa
Za
M
(b)
Za
103
1
2
3
4
5
6
7
8
Pc
Pd
Pb
Pe
10Z
Pa
M

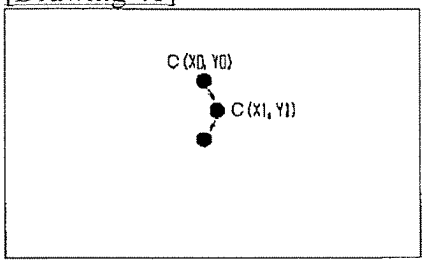
[Drawing 39]


スタート
S81
5点同時検出あり
?
N
Y
S82
中点Cの座標を求める
S83
扇の画像表示
S84
位置の移動あり
?
N
Y
S85
移動距離を求める
S86
・扇の画像を下げて表示
・パレット表示
S87
パレットの操作あり
?
N
Y
S88
操作を受付けて実行
S89
パレットの表示
終了の操作あり
?
N
Y
S90
扇、パレットの表示を終了
エンド

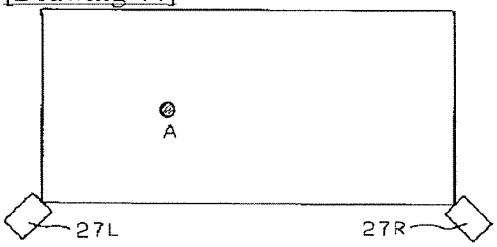
[Drawing 40]



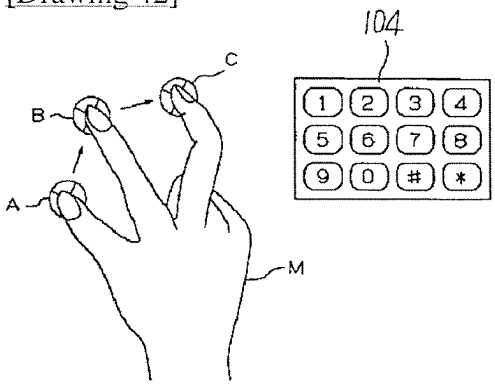
[Drawing 41]



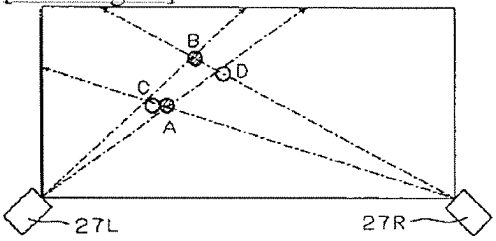
[Drawing 44]



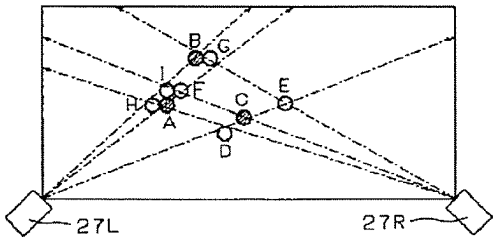
[Drawing 42]



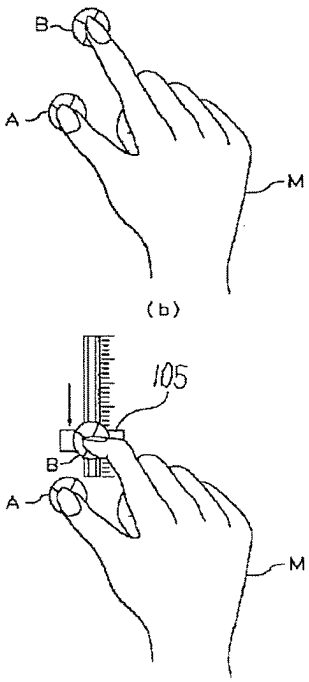
[Drawing 45]



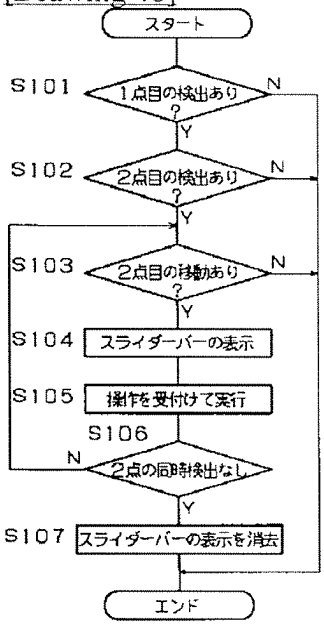
[Drawing 46]



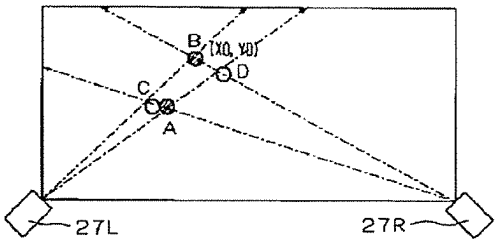
[Drawing 47]



[Drawing 48]



[Drawing 49]



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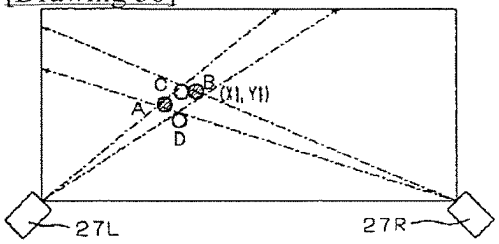

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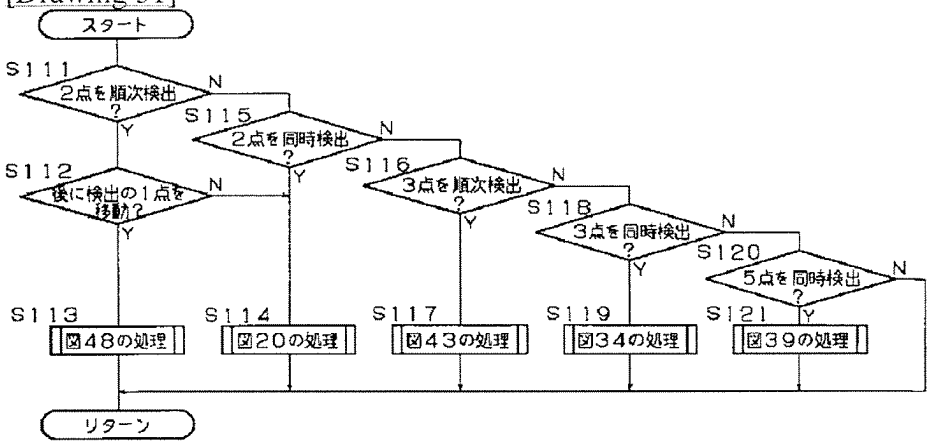
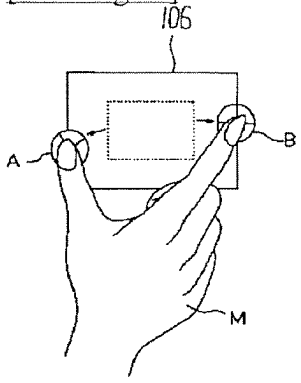
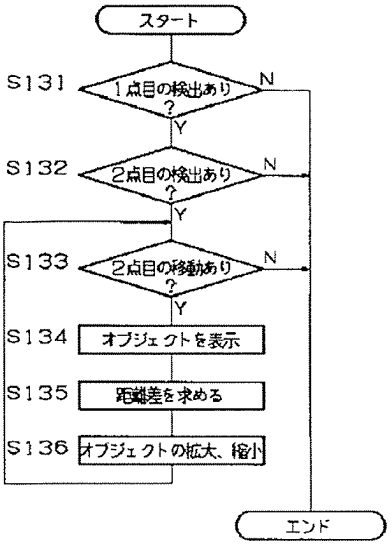


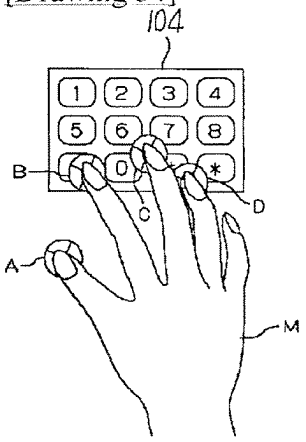
[Drawing 52]



[Drawing 53]

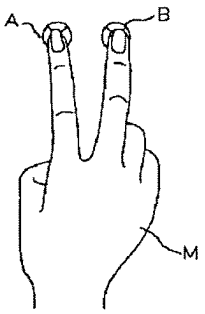


[Drawing 54]

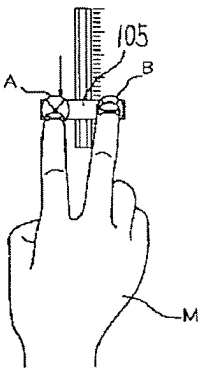


[Drawing 55]

(a)



(b)



[Translation done.]

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		６５７		６５７Ａ	５Ｅ５０１
Ｇ０９Ｇ	5/00	５１０	Ｇ０９Ｇ 5/00	５１０Ｈ	
		５５０		５５０Ｂ	

審査請求　未請求　請求項の数23　ＯＬ　（全 31 頁）　最終頁に続く

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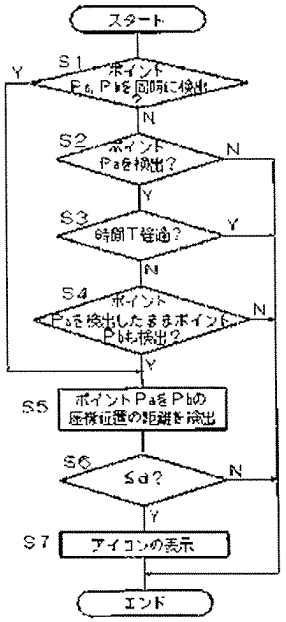
最終頁に続く

(54)【発明の名称】　情報入出力システム、プログラム及び記憶媒体

(57)【要約】
【課題】　すぐ手元の画面上でアイコンを操作することを可能として、操作性を向上させる。
【解決手段】　プラズマディスプレイである表示装置の画面には、その画面上を手指などで指し示した位置の座標を検出する座標入力装置が設けられている。そして、手指などで画面の２点を同時に指し示したことを座標入力装置で検出した場合のみ（ステップＳ１のＹ、Ｓ２のＹ、Ｓ４のＹ）、予め所定のテーブルに登録されているアイコンを指し示した位置の近傍に表示する（ステップＳ７）。



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【特許請求の範囲】

【請求項１】　画像を表示する表示装置と、この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え、前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報入出力システムにおいて．

予め操作画像を登録しておく記憶装置と、

前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは．前記画面上における所定位置に前記記憶装置に登録されている操作画像を表示する操作画像表示手段と、を備えていることを特徴とする情報入出力システム。

【請求項２】　前記複数位置をそれぞれ指し示した時点間の時間を計時する計時手段と、

この計時した時間が予め設定されている所定時間以下であるか否かを判断する第１の比較手段とを備え．

前記操作画像表示手段は．前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項１に記載の情報入出力システム。

【請求項３】　前記複数位置をそれぞれ指し示した座標間の距離を演算する測距手段と、

この演算した距離が予め設定されている所定距離以下であるか否かを判断する第２の比較手段とを備え．

前記操作画像表示手段は．前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項１又は２に記載の情報入出力システム。

【請求項４】　前記記憶装置は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも１つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されていて、

前記操作画像表示手段は．前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう．ことを特徴とする請求項１～３のいずれかの一に記載の情報入出力システム。

【請求項５】　前記記憶装置への登録内容の入力を受付ける受付手段と．

この入力の受付けがされたときは当該受付けた内容で前記記憶装置の登録内容を更新する更新手段と、を備えていることを特徴とする請求項４に記載の情報入出力システム。

【請求項６】　前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と．

前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは．当該検出距離及び方向に応じて所定の操作を受付けて実行する操作手段と．を備えていることを特徴とする請求項１に記載の情報入出力システム。

【請求項７】　前記操作画像表示手段は、前記操作画像

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が表示された状態で前記移動検出手段による検出があったときは、当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更するものである．ことを特徴とする請求項６に記載の情報入出力システム。

【請求項８】　前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と．

前記移動検出手段による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小手段と、を備えていることを特徴とする請求項１に記載の情報入出力システム。

【請求項９】　前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に扉を表示する扉表示手段と．

前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と、

前記扉が表示された状態で前記移動の検出があったときは．当該検出距離及び方向に応じて前記扉の前記画面上での表示位置を変更する扉変更手段と．を備え．

前記操作画像表示手段は．前記操作画像を前記表示位置の変更された前記扉の下から当該扉の移動にしたがって徐々に出現するように表示するものである、請求項１に記載の情報入出力システム。

【請求項１０】　前記操作画像は、アイコン、ダイアル．スライダーバー又はパレットである、ことを特徴とする請求項１～９のいずれかの一に記載の情報入出力システム。

【請求項１１】　前記記憶装置は、前記操作画像を複数種類登録していて、

前記操作画像表示手段は．前記指し示された位置の数及び当該指し示しが同時に行なわれたか又は順次行なわれたかに応じて．前記操作画像の表示を前記複数種類の操作画像の中から選択して行なうこと．を特徴とする請求項１～１０のいずれかの一に記載の情報入出力システム。

【請求項１２】　画像を表示する表示装置と、この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え、前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報入出力システムの制御を行なうことを、コンピュータに実行させるコンピュータに読み取り可能なプログラムにおいて、

前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは．前記画面上における所定位置に予め記憶装置に登録されている操作画像を表示する操作画像表示処理を、

コンピュータに実行させることを特徴とするプログラム。

【請求項１３】　前記複数位置をそれぞれ指し示した時

点間の時間を計時する計時処理と、
この計時した時間が予め設定されている所定時間以下であるか否かを判断する第１の比較処理と、をコンピュータに実行させ、
前記操作画像表示処理は、前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項１２に記載のプログラム。
【請求項１４】　前記複数位置をそれぞれ指し示した座標間の距離を演算する測距処理と、
この演算した距離が予め設定されている所定距離以下であるか否かを判断する第２の比較処理と、
をコンピュータに実行させ、
前記操作画像表示処理は、前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項１２又は１３に記載のプログラム。
【請求項１５】　前記操作画像表示処理は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも１つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されている前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう、ことを特徴とする請求項１２～１４のいずれかの一に記載のプログラム。
【請求項１６】　前記記憶装置への登録内容の入力を受付ける受付処理と、
この入力の受付けがされたときは当該受付けた内容で前記記憶装置の登録内容を更新する更新処理と、をコンピュータに実行させることを特徴とする請求項１５に記載のプログラム。
【請求項１７】　前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、
前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは、当該検出距離及び方向に応じて所定の操作を受付けて実行する操作処理と、をコンピュータに実行させることを特徴とする請求項１２に記載のプログラム。
【請求項１８】　前記操作画像表示処理は、前記操作画像が表示された状態で前記移動検出手段による検出があったときは、当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更するものである、ことを特徴とする請求項１７に記載のプログラム。
【請求項１９】　前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、
前記移動検出処理による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小処理と、をコンピュータに実行させることを特徴とする請求項１２に記載のプログラム。
【請求項２０】　前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、

前記画面上における所定位置に扉を表示する扉表示処理と、
前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、
前記扉が表示された状態で前記移動の検出があったときは、当該検出距離及び方向に応じて前記扉の前記画面上での表示位置を変更する扉変更処理と、をコンピュータに実行させ、
前記操作画像表示処理は、前記操作画像を前記表示位置の変更された前記扉の下から当該扉の移動にしたがって徐々に出現するように表示するものである、請求項１２に記載のプログラム。
【請求項２１】　前記操作画像表示処理は、前記操作画像としてアイコン、ダイアル、スライダーバー又はパレットを表示する、ことを特徴とする請求項１２～２０のいずれかの一に記載のプログラム。
【請求項２２】　前記操作画像表示処理は、前記指し示された位置の数及び当該指し示しが同時に行なわれたか又は順次行なわれたかに応じて、前記操作画像の表示を前記記憶装置に複数種類登録されている操作画像の中から選択して行なうこと、を特徴とする請求項１２～２１のいずれかの一に記載のプログラム。
【請求項２３】　請求項１２～２２のいずれかの一に記載のプログラムを記憶していることを特徴とする記憶媒体。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明は、情報入出力システム及びプログラムに関する。
【０００２】
【従来の技術】近年、文字および画像を表示するための表示装置と、表示装置の前面に情報入力面（タッチパネル面）を配設した座標入力装置と、座標入力装置からの入力に基づいて表示装置の表示制御を行なう制御装置とを備え、表示装置および座標入力装置を用いて電子黒板の表示面および書き込み面を構成した情報入出力システムが提供されている。
【０００３】例えば、スマート・テクノロジィズ社製（SMART Technologies Inc.）のスマート２０００は、コンピュータに接続された液晶プロジェクターを用いて文字・絵・図形・グラフィックの画像をパネルに投影した状態で、パネルの投影面（表示面）の前面に配設された座標入力装置（書き込み面）を用いて手書きの情報をコンピュータに取り込む処理を行なう。そして、コンピュータ内で手書きの情報と画像情報とを合成し、再度、液晶プロジェクターを介してリアルタイムで表示できるようにしている。
【０００４】このような情報入出力システムでは、表示装置によって表示されている画面上の画像に対して、座標入力装置を用いて入力した画像を上書き画像として重

ねて表示できるため、会議．プレゼンテーション．教育現場等において既に広く利用されており、その使用効果が高く評価されている。また、このような情報入出力システムに音声・画像等の通信機能を組み込み、遠隔地間を通信回線で接続することにより、電子会議システムとしても利用されている。

【０００５】また、これらの情報入出力システムに用いる座標入力装置として種々の方式の技術が提案されている。すなわち．この座標入力装置としては、タッチパネル面のような物理的な面を有する方式のほか、光学式のものが提案されている（例えば、特開平１１－１１０１１６号公報参照）。

【０００６】

【発明が解決しようとする課題】ところで、前記のような情報入出力システムを用い、その画面上で各種アプリケーションなどを操作する場合には．画面上にツールバーを表示し、このツールバー上のアイコンを手指．ペンなどの指示部材で指し示すことにより行なうか．あるいは．専用のリモコンを操作することにより行なうことが考えられる。指示部材でアイコンを指し示す場合は、当該指示部材の指し示す位置の座標を座標入力装置で検出し．どのアイコンを指し示しているのかを判断する。

【０００７】しかしながら．情報入出力システムで用いるディスプレイは４０インチ、５０インチといった大画面のものを想定しており．画面上のツールバー（通常、画面の上下又は左右の端に表示されるであろう）のアイコンを指示部材で指し示そうとすると．ユーザは．アイコンを操作するためにいちいち四肢を大きく伸ばしたり．所望のアイコンが表示されている位置まで歩み寄ったり．あるいは．椅子に座って操作する場合にはアイコンをクリックするたびにわざわざ立ち上がったりすることが必要となり．操作が極めて煩雑であるという不具合がある。

【０００８】また、前記のように専用のリモコンで操作する場合には．情報入出力システムの画面上で操作することができないため、画面を見ながら．あるいは．説明しながら操作を行なうような場合には．やはり操作が極めて煩雑であるという不具合がある。

【０００９】この発明の目的は、すぐ手元の画面上でアイコンを操作することを可能として．操作性を向上させることである。

【００１０】この発明の別の目的は．この操作性を向上させる場合に．画面上の１箇所を指し示すことで行なう操作とは容易に区別できるようにすることである。

【００１１】この発明の別の目的は．前記の操作性を向上させる場合に．アイコンの表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別できるようにすることである。

【００１２】この発明の別の目的は．前記の場合に、予め登録されている種類、数又は表示位置でアイコンを表示できるようにすることである。

【００１３】この発明の別の目的は．前記の場合に、表示させるアイコンの詳細についてユーザが所望に登録できるようにして．更に操作性を向上させることである。

【００１４】この発明の別の目的は．画面上の指し示し位置の移動により、ユーザは所定の操作を実行できるようにすることである。

【００１５】この発明の別の目的は．画面上の指し示し位置の移動に応じて、操作画像を操作したように表示できるようにすることである。

【００１６】この発明の別の目的は．操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることである。

【００１７】この発明の別の目的は．画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることである。

【００１８】

【課題を解決するための手段】請求項１に記載の発明は．画像を表示する表示装置と、この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え、前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報入出力システムにおいて．予め操作画像を登録しておく記憶装置と、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは．前記画面上における所定位置に登録されている操作画像を表示する操作画像表示手段と．を備えていることを特徴とする情報入出力システムである。

【００１９】この明細書において、操作画像とは．画面上に表示される図形であって、その図形に対して手指などで所定の動作を行なうことにより．ユーザが様々な操作を情報入出力システムに対して行なうことを受付けるものであり、例えば、アイコン、ダイアル、スライダーバー．パレットなどである。

【００２０】したがって．片手の手指などで画面上の複数箇所を指し示すだけの簡単な操作により、その指し示した位置の近傍等に必要な操作画像を表示することができるので、すぐ手元の画面上で操作画像を操作することができ、操作性を向上させることができる。しかも、画面上の１箇所を指し示す場合には操作画像の表示はないので．１箇所を指し示すことで行なう操作とは容易に区別することができる。

【００２１】請求項２に記載の発明は．請求項１に記載の発明において．前記複数位置をそれぞれ指し示した時点間の時間を計時する計時手段と、この計時した時間が予め設定されている所定時間以下であるか否かを判断する第１の比較手段とを備え．前記操作画像表示手段は、前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう．ことを特徴とする。

【００２２】したがって．ある程度の時間間隔をあけて

画面上の複数箇所を順次指し示したときは操作画像を表示しないので．操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【００２３】請求項３に記載の発明は．請求項１又は２に記載の発明において、前記複数位置をそれぞれ指し示した座標間の距離を演算する測距手段と、この演算した距離が予め設定されている所定距離以下であるか否かを判断する第２の比較手段とを備え、前記操作画像表示手段は．前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする。

【００２４】したがって．ある程度の距離間隔をあけて画面上の複数箇所を指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【００２５】請求項４に記載の発明は．請求項１～３のいずれかの一に記載の発明において．前記記憶装置は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも１つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されていて．前記操作画像表示手段は、前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう、ことを特徴とする。

【００２６】したがって．予め登録されている種類、数又は表示位置で操作画像を表示することができる。

【００２７】請求項５に記載の発明は．請求項４に記載の発明において．前記記憶装置への登録内容の入力を受付ける受付手段と、この入力の受付けがされたときは当該受付けた内容で前記記憶装置の登録内容を更新する更新手段と、を備えていることを特徴とする。

【００２８】したがって．表示させる操作画像の詳細についてユーザの所望に登録することができるので．更に操作性を向上させることができる。

【００２９】請求項６に記載の発明は．請求項１に記載の発明において．前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と．前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは、当該検出距離及び方向に応じて所定の操作を受付けて実行する操作手段と、を備えていることを特徴とする。

【００３０】したがって．画面上の指し示し位置の移動により、ユーザは所定の操作を実行することができる。

【００３１】請求項７に記載の発明は．請求項６に記載の発明において．前記操作画像表示手段は、前記操作画像が表示された状態で前記移動検出手段による検出があったときは、当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更する、ことを特徴とする。

【００３２】したがって．画面上の指し示し位置の移動に応じて、操作画像を操作したように表示させることができる。

【００３３】請求項８に記載の発明は．請求項１に記載の発明において．前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と．前記移動検出手段による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小手段と．を備えていることを特徴とする。

【００３４】したがって．操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることができる。

【００３５】請求項９に記載の発明は．請求項１に記載の発明において．前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に扉を表示する扉表示手段と．前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と．前記扉が表示された状態で前記移動の検出があったときは、当該検出距離及び方向に応じて前記扉の前記画面上での表示位置を変更する扉変更手段と、を備え、前記操作画像表示手段は、前記操作画像を前記表示位置の変更された前記扉の下から当該扉の移動にしたがって徐々に出現するように表示するものである。

【００３６】したがって．画面上で複数の位置を指し示したときに直ちに操作画像を表示せず．指し示した位置を移動すると徐々に移動する扉の下から操作画像を表示するようにすることができるので、あまり見せたくない操作画像を表示する場合などに好適である。

【００３７】請求項１０に記載の発明は、請求項１～９のいずれかの一に記載の発明において．前記操作画像は．アイコン．ダイアル．スライダーバー又はパレットである、ことを特徴とする。

【００３８】したがって．操作画像としてアイコン、ダイアル、スライダーバー又はパレットを用いることができる。

【００３９】請求項１１に記載の発明は、請求項１～１０のいずれかの一に記載の発明において、前記記憶装置は．前記操作画像を複数種類登録していて、前記操作画像表示手段は．前記指し示された位置の数及び当該指し示しが同時に行なわれたか又は順次行なわれたかに応じて．前記操作画像の表示を前記複数種類の操作画像の中から選択して行なうこと．を特徴とする。

【００４０】したがって．画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることができる。

【００４１】請求項１２に記載の発明は、画像を表示する表示装置と．この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え．前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報入出力システムの制御を行なうことを、コンピュータに実行させるコンピ

ュータに読み取り可能なプログラムにおいて、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に予め記憶装置に登録されている操作画像を表示する操作画像表示処理を、コンピュータに実行させることを特徴とするプログラムである。

【００４２】したがって、片手の手指などで画面上の複数箇所を指し示すだけの簡単な操作により、その指し示した位置の近傍等に必要な操作画像を表示することができるので、すぐ手元の画面上で操作画像を操作することができ、操作性を向上させることができる。しかも、画面上の１箇所を指し示す場合には操作画像の表示はないので、１箇所を指し示すことで行なう操作とは容易に区別することができる。

【００４３】請求項１３に記載の発明は、請求項１２に記載の発明において、前記複数位置をそれぞれ指し示した時点間の時間を計時する計時処理と、この計時した時間が予め設定されている所定時間以下であるか否かを判断する第１の比較処理と、をコンピュータに実行させ、前記操作画像表示処理は、前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする。

【００４４】したがって、ある程度の時間間隔をあけて画面上の複数箇所を順次指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【００４５】請求項１４に記載の発明は、請求項１２又は１３に記載の発明において、前記複数位置をそれぞれ指し示した座標間の距離を演算する測距処理と、この演算した距離が予め設定されている所定距離以下であるか否かを判断する第２の比較処理と、をコンピュータに実行させ、前記操作画像表示処理は、前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする。

【００４６】したがって、ある程度の距離間隔をあけて画面上の複数箇所を指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【００４７】請求項１５に記載の発明は、請求項１２～１４のいずれかの一に記載の発明において、前記操作画像表示処理は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも１つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されている前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう、ことを特徴とする。

【００４８】したがって、予め登録されている種類、数又は表示位置で操作画像を表示することができる。

【００４９】請求項１６に記載の発明は、請求項１５に記載の発明において、前記記憶装置への登録内容の入力

を受付ける受付処理と、この入力の受付けがされたときは当該受付けた内容で前記記憶装置の登録内容を更新する更新処理と、をコンピュータに実行させることを特徴とする。

【００５０】したがって、表示させる操作画像の詳細についてユーザの所望に登録することができるので、更に操作性を向上させることができる。

【００５１】請求項１７に記載の発明は、請求項１２に記載の発明において、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理をコンピュータに実行させ、操作画像表示処理は、この検出が前記操作画像が表示された状態であったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更するものである、ことを特徴とする。

【００５２】したがって、画面上の指し示し位置の移動により、ユーザは所定の操作を実行することができる。

【００５３】請求項１８に記載の発明は、請求項１７に記載の発明において、前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは、当該検出距離及び方向に応じて所定の操作を受付けて実行する操作処理を、コンピュータに実行させることを特徴とする。

【００５４】したがって、画面上の指し示し位置の移動に応じて、操作画像を操作したように表示させることができる。

【００５５】請求項１９に記載の発明は、請求項１２に記載の発明において、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、前記移動検出処理による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小処理と、をコンピュータに実行させることを特徴とする。

【００５６】したがって、操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることができる。

【００５７】請求項２０に記載の発明は、請求項１２に記載の発明において、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に扉を表示する扉表示処理と、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、前記扉が表示された状態で前記移動の検出があったときは、当該検出距離及び方向に応じて前記扉の前記画面上での表示位置を変更する扉変更処理と、をコンピュータに実行させ、前記操作画像表示処理は、前記操作画像を前記表示位置の変更された前記扉の下から当該扉の移動にしたがって徐々に出現するように表示するものである。

【００５８】したがって、画面上で複数の位置を指し示したときに直ちに操作画像を表示せず、指し示した位置を移動すると徐々に移動する扉の下から操作画像を表示するようにすることができるので、あまり見せたくない

操作画像を表示する場合などに好適である。

【００５９】請求項２１に記載の発明は、請求項１２～２０のいずれかの一に記載の発明において、前記操作画像表示処理は、前記操作画像としてアイコン、ダイアル、スライダーバー又はパレットを表示する、ことを特徴とする。

【００６０】したがって、操作画像としてアイコン、ダイアル、スライダーバー又はパレットを用いることができる。

【００６１】請求項２２に記載の発明は、請求項１２～２１のいずれかの一に記載の発明において、前記操作画像表示処理は、前記指し示された位置の数及び当該指し示しが同時に行なわれたか又は順次行なわれたかに応じて、前記操作画像の表示を前記記憶装置に複数種類登録されている操作画像の中から選択して行なうこと、を特徴とする。

【００６２】したがって、画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることができる。

【００６３】請求項２３に記載の発明は、請求項１２～２２のいずれかの一に記載のプログラムを記憶していることを特徴とする記憶媒体である。

【００６４】したがって、請求項１２～２２のいずれかの一に記載の発明と同様の作用、効果を奏することができる。

【００６５】

【発明の実施の形態】この発明の一実施の形態について説明する。

【００６６】図１は本実施の形態である情報入出力システム１を概略的に示す外観斜視図であり、図２は情報入出力システム１の電気的な接続を示すブロック図である。図１、図２に示すように、情報入出力システム１は、表示装置であるプラズマディスプレイパネル（ＰＤＰ）２及び座標入力装置３で構成される入出力装置であるパネル部４と、パーソナルコンピュータ等のコンピュータ５と、原稿の画像を読み取るためのスキャナ６と、画像データを記録紙に出力するプリンタ７と、ビデオプレイヤー８を収納する機器収納部９とを備えている。

【００６７】ＰＤＰ２は、電子黒板として利用可能な４０インチや５０インチ等の大画面タイプのもので、かかる大画面タイプのディスプレイであれば、ＣＲＴ、ＬＣＤなどを用いてもよい。また、図示は省略するが、ＰＤＰ２にはビデオ入力端子やスピーカーが設けられており、ビデオプレイヤー８をはじめ、その他レーザディスクプレイヤー、ＤＶＤプレイヤー、ビデオカメラ等の各種情報機器やＡＶ機器を接続し、ＰＤＰ２を大画面モニタとして利用することが可能な構成になっている。

【００６８】図２に示すように、情報入出力システム１は、コンピュータ５にＰＤＰ２、スキャナ６、プリンタ７、ビデオプレイヤー８をそれぞれ接続し、コンピュータ５によってシステム全体を制御する構成である。また、コンピュータ５には、ペン等の指示部材や指先等の所定物体で指示された情報入力領域３ａ内の位置座標の演算等を行なう座標入力装置３用のコントローラ１０が接続されており、このコントローラ１０を介して座標入力装置３もコンピュータ５に接続されている。また、コンピュータ５を介して情報入出力システム１をネットワーク１１に接続することができ、ネットワーク１１上に接続された他のコンピュータで作成したデータをＰＤＰ２に表示し、あるいは、情報入出力システム１で作成したデータを他のコンピュータに転送することも可能になっている。

【００６９】次に、コンピュータ５について説明する。ここで、図３はコンピュータ５に内蔵される各部の電気的接続を示すブロック図である。図３に示すように、コンピュータ５は、システム全体を制御するＣＰＵ１２と、起動プログラム等を記録したＲＯＭ１３と、ＣＰＵ１２のワークエリアとして使用されるＲＡＭ１４とがバス２１を介して接続されている。また、バス２１には、所定のインターフェイスを介して文字・数値・各種指示等の入力を行なうためのキーボード１５と、カーソルの移動や範囲選択等を行なうためのマウス１６と、記憶装置であるハードディスク１７と、ＰＤＰ２に接続されておりそのＰＤＰ２に対する画像の表示を制御するグラフィックス・ボード１８と、ネットワーク１１に接続するためのネットワーク・カード（またはモデム）１９とが接続され、また、コントローラ１０・スキャナ６・プリンタ７等を接続するためのインターフェイス（Ｉ／Ｆ）２０も接続されている。

【００７０】ハードディスク１７には、オペレーティング・システム（ＯＳ）２２、コントローラ１０を介してコンピュータ５上で座標入力装置３を動作させるためのデバイスドライバ２３、描画ソフト・ワードプロセッサソフト・表計算ソフト・プレゼンテーションソフト・キャリブレーションソフトウエア等の各種アプリケーションプログラム２４等が格納されている。

【００７１】また、コンピュータ５には、ＯＳ２２、デバイスドライバ２３や各種アプリケーションプログラム２４等の各種のプログラムコード（制御プログラム）を記録した記録媒体２６（フレキシブルディスク、ハードディスク、光ディスク（ＣＤ－ＲＯＭ、ＣＤ－Ｒ、ＣＤ－Ｒ／Ｗ、ＤＶＤ－ＲＯＭ、ＤＶＤ－ＲＡＭなど）、光磁気ディスク（ＭＯ）、メモリカードなど各種のメディアを用いることができる）に記録されているプログラムコードを読み取る装置であるプログラム読取装置２５（記録媒体２６の記録方式に応じて、フレキシブルディスクドライブ装置、ＣＤ－ＲＯＭドライブ装置、ＭＯドライブ装置等の装置を用いることができる）が搭載されている。

【００７２】各種アプリケーションプログラム２４は、

コンピュータ５への電源の投入に応じて起動するＯＳ２２による制御の下、ＣＰＵ１２によって実行される。例えば、キーボード１５やマウス１６の所定の操作によって描画ソフトを起動した場合には、ＰＤＰ２にグラフィックス・ボード１８を介して描画ソフトに基づく所定の画像が表示される。また、デバイスドライバ２３もＯＳ２２とともに起動され、コントローラ１０を介した座標入力装置３からのデータ入力が可能な状態になる。このように描画ソフトを起動した状態で座標入力装置３の情報入力領域３ａにユーザが手指などの指示部材で文字や図形などをなぞって描いた場合、その指示部材の移動軌跡の座標情報が画像データとしてコンピュータ５に入力され、例えば、ＰＤＰ２に表示されている画面上の画像に対して指示部材の移動軌跡を結ぶラインが上書き画像として重ねて表示される。あるいは、逆に指示部材の移動軌跡を結ぶ領域の画像が消去される。そして、この画像を重ねて表示する、あるいは、画像を消去するＰＤＰ２の画面２ａ上における位置は、情報入力領域３ａでユーザが手指などの指示部材でなぞって描いた位置と直なるようにしている。

【００７３】線や文字を上書きする場合を例に、より詳細に説明すると、コンピュータ５のＣＰＵ１２は、入力された画像データに基づいて線や文字を描画するための描画情報を生成し、入力された座標情報に基づく位置座標に合わせてグラフィックス・ボード１８に設けられるビデオメモリ（図示せず）に書き込んでいく。その後、グラフィックス・ボード１８が、ビデオメモリに書き込まれた描画情報を画像信号としてＰＤＰ２に送信することにより、ユーザが書いた文字と同一の文字が、ＰＤＰ２に表示されることになる。つまり、コンピュータ５は座標入力装置３をマウス１６のようなポインティングデバイスとして認識しているため、コンピュータ５では、描画ソフト上でマウス１６を用いて文字を書いた場合と同様な処理が行なわれることになる。

【００７４】次に、座標入力装置３について詳細に説明する。なお、本実施の形態の情報入出力システム１に適用し得る座標入力装置３としては、検出方式の異なる種々の方式のものが考えられる。例えば、指示部材がＰＤＰ２の画面２ａ上（情報入力領域３ａ）において指し示す座標位置を、機械的、電気的に検出する座標入力装置３としてタッチパネルを挙げることができる。

【００７５】しかし、以下では、より好適な例として指示部材がＰＤＰ２の画面２ａ上（情報入力領域３ａ）において指し示す座標位置を光学的に検出する座標入力装置３について、検出方式の異なるものを５例（第１の座標入力装置３Ａ～第５の座標入力装置３Ｅ）挙げ、その構成及び原理について説明する。

【００７６】Ａ．第１の座標入力装置

まず、第１の座標入力装置３Ａについて図４～図８に基づいて説明する。この第１の座標入力装置３Ａは、いわゆる再帰光遮蔽方式を用いるものである。

【００７７】ここで、図４は第１の座標入力装置３Ａの構成を概略的に示す説明図である。図４に示すように、座標入力装置３Ａは、ＰＤＰ２の画面２ａのサイズに対応したサイズで横長の四角形状の情報入力領域３ａを備えている。この情報入力領域３ａは、手指などでなぞることにより文字や図形等の入力を可能にする領域である。この情報入力領域３ａの下方両端部に位置する角部の近傍には、発光と受光とを行なう光学ユニット２７（左側光学ユニット２７Ｌ、右側光学ユニット２７Ｒ）が所定の取付角度で設けられている。これらの光学ユニット２７からは、平面若しくはほぼ平面をなし、例えばL_1、L_2，L_3，・・・，L_n（R_1，R_2、R_3，・・・，R_n）といった光（プローブ光）の束で構成される扇形状で薄膜状の光束膜が、情報入力領域３ａの全域に行き渡るようにＰＤＰ２の画面２ａの表面に沿って平行に投光される。

【００７８】また、座標入力装置３の情報入力領域３ａの下部を除く周辺部には、再帰性反射部材２８が設けられている。この再帰性反射部材２８は、例えば円錐形状のコーナーキューブを多数配列して形成されており、入射した光をその入射角度によらずに所定の位置に向けて反射する特性を有している。例えば、左側光学ユニット２７Ｌから投光されたプローブ光L_3は、再帰性反射部材２８によって反射され、再び同一光路を辿る再帰反射光L_3'として左側光学ユニット２７Ｌにより受光されることになる。つまり、再帰性反射部材２８によっても情報入力領域３ａが形成されている。

【００７９】次に、光学ユニット２７について説明する。ここで、図５は光学ユニット２７の構造を概略的に示す構成図である。なお、図５はｘ－ｚ方向を主体に示しているが、二点鎖線で示す部分については同一の構成要素を別方向（ｘ－ｙ方向、又はｙ－ｚ方向）から見た図である。

【００８０】図５に示すように、光学ユニット２７は、投光手段２９と受光手段３０とを備えている。投光手段２９は、スポットをある程度絞ることの可能なＬＤ（LaserDiode），ピンポイントＬＥＤ（Light Emitting Diode）等の光源３１を備えている。この光源３１からＰＤＰ２の画面２ａに対して垂直に照射された光は、一方向の倍率のみを変更可能なシリンドリカルレンズ３２によってｘ方向にコリメートされる。シリンドリカルレンズ３２によってｘ方向にコリメートされた光は、シリンドリカルレンズ３２とは曲率の分布が直交する２枚のシリンドリカルレンズ３３，３４によりｙ方向に対して集光される。つまり、これらのシリンドリカルレンズ群（シリンドリカルレンズ３２，３３，３４）の作用により、光源３１からの光を線状に集光した領域がシリンドリカルレンズ３４の後方に形成されることになる。ここに、ｙ方向に狭くｘ方向に細長いスリットを有するスリット

板３５を配置する。したがって、シリンドリカルレンズ群（シリンドリカルレンズ３２，３３，３４）を通過した光は、スリット板３５のスリット位置において、線状の二次光源３６を形成する。二次光源３６から発した光は、ハーフミラー３７で折り返され、ＰＤＰ２の画面２ａの垂直方向には広がらずに画面２ａの表面に沿った平行光で、画面２ａと平行方向には二次光源３６を中心にした扇形状の光束膜となって情報入力領域３ａを進行する。換言すれば、扇形状の光が情報入力領域３ａを形成する。これらのシリンドリカルレンズ群（シリンドリカルレンズ３２，３３，３４）とスリット板３５とによって、集光光学系が形成されている。

【００８１】前述したように、扇形状となって情報入力領域３ａを進行した光束膜は、再帰性反射部材２８で再帰的に反射され、再び同一光路を辿ってハーフミラー３７に戻ることになる。したがって、再帰性反射部材２８で再帰的に反射された光束膜も情報入力領域３ａを形成する。

【００８２】再帰性反射部材２８で反射されてハーフミラー３７に戻った再帰反射光は、ハーフミラー３７を透過して受光手段３０に入射する。受光手段３０に入射した再帰反射光は、集光レンズであるシリンドリカルレンズ３８を通って線状にされた後、このシリンドリカルレンズ３８から距離ｆ（ｆはシリンドリカルレンズ３８の焦点距離）の間隔で設けられたＣＣＤ３９において、プローブ光毎に異なる位置で受光される。なお、本実施の形態のＣＣＤ３９は、１次元ＣＣＤであって、その画素数は2,048画素とされている。

【００８３】詳細には、再帰性反射部材２８で反射された再帰反射光は、ｚ軸方向ではシリンドリカルレンズ３８の作用を受けず、コリメートされたままＣＣＤ３９に到達する。また、再帰反射光は、ＰＤＰ２の画面２ａと平行方向では、シリンドリカルレンズ３８の中心に集光するように伝搬し、その結果、シリンドリカルレンズ３８の作用を受けてシリンドリカルレンズ３８の焦点面に設置されたＣＣＤ３９上に結像する。これにより、ＣＣＤ３９上に再帰反射光の有無に応じて光強度の分布が形成される。すなわち、再帰反射光を指示部材Ｐで遮った場合、ＣＣＤ３９上の遮られた再帰反射光に相当する位置に光強度が弱い点（後述するピーク点）が生じることになる。再帰反射光を受光したＣＣＤ３９は、再帰反射光（プローブ光）の光強度分布に基づいた電気信号を生成し、前述したコントローラ１０に対して出力する。なお、図５に示すように、二次光源３６とシリンドリカルレンズ３８とは、ハーフミラー３７に対して共に距離ｄの位置に配設されて共役な位置関係にある。

【００８４】ここで、図６は受光素子３９から再帰反射光の光強度分布に基づいた電気信号が入力され、情報入力領域３ａを進行する光が遮られた位置の座標を特定する処理を実行するコントローラ１０のブロック構成図である。このコントローラ１０は、光学ユニット２７（左側光学ユニット２７Ｌ、右側光学ユニット２７Ｒ）の光源（ＬＤ）３１の発光制御と、光学ユニット２７（左側光学ユニット２７Ｌ、右側光学ユニット２７Ｒ）のＣＣＤ３９からの出力の演算を行なうものである。図６に示すように、コントローラ１０には、各部を集中的に制御するＣＰＵ４０が設けられており、このＣＰＵ４０には、プログラム及びデータを記録するＲＯＭ４１、各種データを書き換え自在に格納してワークエリアとして機能するＲＡＭ４２、コンピュータ５に接続するためのインターフェイス４３、Ａ／Ｄコンバータ４４及びＬＤドライバ４５がバス接続されている。また、ＣＰＵ４０には、各種のプログラムコード（制御プログラム）を格納するハードディスク４６や不揮発性のメモリであるＥＥＰＲＯＭ４７がバス接続されている。ここに、ＣＰＵ４０、ＲＯＭ４１及びＲＡＭ４２によりマイクロコンピュータが構成されている。このようなマイクロコンピュータには、各種のプログラムコード（制御プログラム）を記録した記録媒体４９、すなわち、フレキシブルディスク、ハードディスク、光ディスク（ＣＤ－ＲＯＭ、ＣＤ－Ｒ、ＣＤ－Ｒ／Ｗ、ＤＶＤ－ＲＯＭ、ＤＶＤ－ＲＡＭなど）、光磁気ディスク（ＭＯ）、メモリカードなどに記録されているプログラムコードを読み取る装置であるフレキシブルディスクドライブ装置、ＣＤ－ＲＯＭドライブ装置、ＭＯドライブ装置等のプログラム読取装置４８が接続されている。

【００８５】ＣＣＤ３９からの出力を演算する回路として、ＣＣＤ３９の出力端子に、アナログ処理回路５１が図のように接続される。ＣＣＤ３９に入射した反射光は、ＣＣＤ３９内で光の強度に応じた電圧値を持つアナログの画像データに変換され、アナログ信号として出力される。このアナログ信号は、アナログ処理回路５１で処理された後、Ａ／Ｄコンバータ４４によってデジタル信号に変換されてＣＰＵ４０に渡される。この後、ＣＰＵ４０によって指示部材Ｐの二次元座標の演算が行なわれる。

【００８６】ハードディスク４６に格納された各種のプログラムコード（制御プログラム）または記録媒体４９に記録された各種のプログラムコード（制御プログラム）は、コントローラ１０への電源の投入に応じてＲＡＭ４２に書き込まれ、各種のプログラムコード（制御プログラム）が実行されることになる。

【００８７】続いて、制御プログラムに基づいてＣＰＵ４０によって実行される機能について説明する。ここでは、本実施の形態の座標入力装置３の備える特長的な機能である座標検出処理について以下において具体的に説明する。

【００８８】ここで、図７は座標入力装置３の情報入力領域３ａ内の一点を指示部材Ｐで指し示した一例を示す正面図である。図７に示すように、例えば、左側光学ユ

ニット２７Ｌから照射されたＬ１，Ｌ２，Ｌ３，・・・，Ｌｎといったプローブ光で構成される扇形状の光の中でｎ番目のプローブ光Ｌｎが指示部材Ｐによって遮られた場合、そのプローブ光Ｌｎは再帰性反射部材２８に到達することはない。

【００８９】このときＣＣＤ３９上の光強度分布を考える。ここで、図８はＣＣＤ３９の検出動作を模式的に示す説明図である。指示部材Ｐが情報入力領域３ａ内に挿入されていなければ、ＣＣＤ３９上の光強度分布はほぼ一定であるが、図８に示すように指示部材Ｐが情報入力領域３ａ内に挿入されてプローブ光Ｌｎが指示部材Ｐによって遮られた場合、そのプローブ光Ｌｎは光学ユニット２７のＣＣＤ３９によって受光されることはないため、プローブ光Ｌｎに対応する光学ユニット２７のＣＣＤ３９上の所定の位置Ｘｎが光強度の弱い領域（暗点）となる。この光強度の弱い領域（暗点）である位置Ｘｎは、ＣＣＤ３９から出力される光強度の波形にピーク点※

$$\theta_n = \tan^{-1}(a/f) \quad \cdots\cdots (1)$$

と表すことができる。ただし、ｆはシリンドリカルレンズ３８の焦点距離である。ここで、左側光学ユニット２７Ｌにおけるθ_nを$\theta_n L$、ａをＸｎＬと置き換える。

【００９２】さらに、図７において、左側光学ユニット２７Ｌと情報入力領域３ａとの幾何学的な相対位置関係の変換係数ｇにより、指示部材Ｐと左側光学ユニット２７Ｌとのなす角度θＬは、（１）式で求められるＸｎＬの関数として、

$$\theta L = g(\theta_n L) \quad \cdots\cdots (2)$$

ただし、$\theta_n L = \tan^{-1}(X_n L/f)$

と表すことができる。

【００９３】同様に、右側光学ユニット２７Ｒについて※

$$x = w \cdot \tan\theta R / (\tan\theta L + \tan\theta R) \quad \cdots\cdots (4)$$

$$y = w \cdot \tan\theta L \cdot \tan\theta R / (\tan\theta L + \tan\theta R) \quad \cdots\cdots (5)$$

として算出することができる。

【００９５】これらの（１）（２）（３）（４）（５）式は制御プログラムの一部として予めハードディスク４６や記録媒体４９に格納されており、（１）（２）（３）（４）（５）式により、指示部材Ｐの位置座標（ｘ、ｙ）は、ＸｎＬ，ＸｎＲの関数として算出される。すなわち、左側光学ユニット２７ＬのＣＣＤ３９上の暗点の位置と右側光学ユニット２７ＲのＣＣＤ３９上の暗点の位置とを検出することで、指示部材Ｐの位置座標（ｘ，ｙ）が算出されることになる。

【００９６】このようにして算出された指示部材Ｐの位置座標（ｘ，ｙ）は、コントローラ１０を介してコンピュータ５へと出力され、所定の処理に用いられることになる。

【００９７】そして、このような座標入力装置３Ａによれば、情報入力領域３ａにおいて、無視差、完全透明、高い描画感を実現することが可能になっている。

【００９８】Ｂ．第２の座標入力装置

＊として出現することになるので、ＣＰＵ４０は、このような光強度の波形におけるピーク点の出現を画圧の変化により認識し、この光強度の波形のピーク点となった暗点の位置Ｘｎを検出する。

【００９０】また、光強度の波形のピーク点となった暗点位置Ｘｎが検出されると、暗点位置ＸｎからＣＣＤ３９の中心画素までの距離が、例えばＣＣＤ３９の画素番号（例えば、図８においては、画素番号ｍ）に基づいて検出される。

【００９１】光強度の弱い領域（暗点）である位置Ｘｎ（左側光学ユニット２７ＬのＣＣＤ３９上ではＸｎＬ，右側光学ユニット２７ＲのＣＣＤ３９上ではＸｎＲ）は、遮られたプローブ光の出射／入射角θ_nと対応しており、Ｘｎを検出することによりθ_nを知ることができる。即ち、暗点位置ＸｎからＣＣＤ３９の中心画素までの距離をａとすると、θ_nはａの関数として、

$$\theta_n = \tan^{-1}(a/f) \quad \cdots\cdots (1)$$

※も、上述の（１）（２）式中の記号Ｌを記号Ｒに置き換えて、右側光学ユニット２７Ｒと情報入力領域３ａとの幾何学的な相対位置関係の変換係数ｈにより、

$$\theta R = h(\theta_n R) \quad \cdots\cdots (3)$$

ただし、$\theta_n R = \tan^{-1}(X_n R/f)$

と表すことができる。

【００９４】ここで、左側光学ユニット２７ＬのＣＣＤ３９の中心位置と右側光学ユニット２７ＲのＣＣＤ３９の中心位置との距離を図７に示すｗとすると、情報入力領域３ａ内の指示部材Ｐで指示した点の２次元座標（ｘ、ｙ）は、三角測量の原理により、

次に、第２の座標入力装置３Ｂについて図９～図１１に基づいて説明する。なお、第１の座標入力装置３Ａで説明した部分と同一部分については同一符号を用い、説明も省略する。

【００９９】この第２の座標入力装置３Ｂは、いわゆる再帰光反射方式の座標入力装置である。

【０１００】ここで、図９は座標入力装置３Ｂに用いられる指示部材６１を示す斜視図である。また、図１０は座標入力装置３Ｂの情報入力領域３ａ内の一点を指示部材６１で指し示した一例を示す正面図である。図９に示すように、座標入力装置３Ｂの情報入力領域３ａ内の一点を指し示すために用いられる指示部材６１の先端近傍には、再帰性反射部材６２が設けられている。この再帰性反射部材６２は、例えば円錐形状のコーナーキューブを多数配列して形成されており、入射した光をその入射角度によらずに所定の位置に向けて反射する特性を有している。例えば、左側光学ユニット２７Ｌから投光されたプローブ光Ｌｎは、図１０に示すように、再帰性反射

部材６２によって反射され，再び同一光路を辿る再帰反射光L_R'として左側光学ユニット２７Ｌにより受光されることになる。そのため，図１０に示すように，座標入力装置３Ｂにおいては，前述した座標入力装置３Ａのように情報入力領域３ａに再帰性反射部材２８を設ける必要はない。なお，指示部材６１はペン状の形状をしており，光沢のある金属製よりゴムやプラスチックなどの材質が望ましい。

【０１０１】したがって，このような指示部材６１の再帰性反射部材６２を備えた先端近傍を座標入力装置３Ｂの情報入力領域３ａの適当な位置（ｘ，ｙ）に挿入し，例えば左側光学ユニット２７Ｌから投光された扇形状の光束膜の中のプローブ光L_Pが指示部材６１の再帰性反射部材６２によって反射された場合，その再帰反射光L_R'は左側光学ユニット２７ＬのＣＣＤ３９によって受光される。このようにしてＣＣＤ３９が再帰反射光L_R'を受光した場合には，再帰反射光L_R'に対応するＣＣＤ３９上の所定の位置Ｄｎが光強度の強い領域（明点）となる。つまり，図１１に示すように，ＣＣＤ３９上では位置Ｄｎの位置に光強度が強い領域が生じ，ＣＣＤ３９からの光の強度分布の形状にはピークが出現する。このピークが出現する位置Ｄｎは反射されたプローブ光の出射／入射角θnと対応しており，Ｄｎを検出することによりθnを知ることができる。つまり，このような再帰光反射方式の座標入力装置３Ｂの場合も，前述した再帰光遮蔽方式の座標入力装置３Ａと同様に，光強度の波形に出現するピークに基づく三角測量の手法により指示部材６１の位置座標（ｘ，ｙ）が算出されることになる。

【０１０２】このようにして算出された指示部材６１の位置座標（ｘ，ｙ）は，コントローラ１０を介してコンピュータ５へと出力され，所定の処理に用いられることになる。

【０１０３】そして，このような座標入力装置３Ｂによれば，情報入力領域３ａにおいて，無視差，完全透明，高い描画感を実現することが可能になっている。なお，前記のような指示部材６１を用いず，指示部材として手指などを用いることもできる。

【０１０４】Ｃ．第３の座標入力装置

次に，第３の座標入力装置３Ｃについて図１２～図１４に基づいて説明する。なお，第１の座標入力装置３Ａで説明した部分と同一部分については同一符号を用い，説明も省略する。

【０１０５】この第３の座標入力装置３Ｃは，第１の座標入力装置３Ａにおける光学ユニットの変形例である。詳細には，第１の座標入力装置３Ａで用いた光学ユニット２７においては扇形状の光束膜を投光して情報入力領域を形成したが，座標入力装置３Ｃにおいては，ポリゴンミラー等の回転走査系を有しており，その回転走査系によって光源から出射された光ビームを放射状に投光して情報入力領域を形成する光学ユニット７０を用いるものである。

【０１０６】ここで，図１２は光学ユニット７０を概略的に示す平面図である。図１２に示すように，光学ユニット７０は，駆動回路（図示せず）を有してレーザ光を出射する光源であるＬＤ（Laser Diode）７１とハーフミラー７２とポリゴンミラー７３と集光レンズ７４とで構成される投光手段７０ａと，受光素子７５とが備えられている。受光素子７５は，集光レンズ７４から距離ｆ（ｆは集光レンズ７４の焦点距離）の間隔で設けられたＰＤ（Photo Diode）で構成されている。このような光学ユニット７０は，ＬＤ７１から出射したレーザ光をハーフミラー７２で折り返した後，パルスモータ（図示せず）により所定の角速度ωtで回転駆動されるポリゴンミラー７３によって放射状に順次反射する。したがって，光学ユニット７０は，ビーム光を放射状に繰り返し投光することになる。つまり，２つの光学ユニット７０から放射状に投光されるビーム光によって情報入力領域３ａが形成されることになる。一方，反射されて光学ユニット７０に入射したビーム光は，ポリゴンミラー７３によって反射され，ハーフミラー７２に到達する。ハーフミラー７２に到達した反射ビーム光は，ハーフミラー７２を透過して受光素子７５に到達し，電気信号に変換される。

【０１０７】次に，このような光学ユニット７０を第１の座標入力装置３Ａで用いた光学ユニット２７に代えて適用した座標入力装置３Ｃについて説明する。図１３に示すように，情報入力領域３ａ中の或る位置に指示部材Ｐが挿入されてあるビーム光が遮蔽されると，そのビーム光は再帰性反射部材２８で反射されることはないことから，受光素子７５に到達することはない。このように情報入力領域３ａ中の或る位置に指示部材Ｐが挿入されてあるビーム光が遮蔽された場合，受光素子７５からの光の強度分布の形状にはディップが出現する。

【０１０８】各部の電気的接続等については技術的に公知であるため詳細な説明は省略するが，図１４に示すように，情報入力領域３ａに指示部材Ｐが挿入されていない場合には光強度は"$I = I_0$"を示すが，情報入力領域３ａに指示部材Ｐが挿入されて受光素子７５に再帰光が戻らない場合には光強度は"$I = I_0$"を示すことになる。このように光強度が"$I = I_0$"である部分が，ディップである。なお，図１４中，時間$t = t_0$は，ポリゴンミラー７３の回転の基準位置であって，回転走査されるビーム光が所定の角度に達した時点である。

【０１０９】したがって，光強度が"$I = I_0$"となった時間ｔをt_1であるとすれば，情報入力領域３ａに挿入された指示部材Ｐにより遮蔽されたビーム光の出射角度θは，

$\theta = \omega(t_1 - t_0) = \omega\Delta t$

として算出される。つまり，左右それぞれに設けられた

光学ユニット７０（７０Ｌ，７０Ｒ）において情報入力領域３ａに挿入された指示部材Ｐにより遮蔽されたビーム光の出射角度θ（θｎＬ，θｎＲ）が算出され，それらの出射角度θ（θｎＬ，θｎＲ）に基づく三角測量の手法によって指示部材Ｐを挿入した位置座標（ｘ，ｙ）が算出されることになる。

【０１１０】このようにして算出された指示部材Ｐの位置座標（ｘ，ｙ）は，コントローラ１０を介してコンピュータ５へと出力され，所定の処理に用いられることになる。

【０１１１】そして，このような座標入力装置３Ｃによれば，情報入力領域３ａにおいて，無視差，完全透明，高い描画感を実現することが可能になっている。

【０１１２】Ｄ．第４の座標入力装置

次に，第４の座標入力装置３Ｄについて図１５～図１６に基づいて説明する。なお，第２の座標入力装置３Ｂ及び第３の座標入力装置３Ｃで説明した部分と同一部分については同一符号を用い，説明も省略する。

【０１１３】この第４の座標入力装置３Ｄは，第２の座標入力装置３Ｂにおける光学ユニットの変形例である。詳細には，第２の座標入力装置３Ｂで用いた光学ユニット２７においては扇形状の光束膜を投光して情報入力領域を形成したが，第４の座標入力装置３Ｄにおいては，ポリゴンミラー等の回転走査系を有しており，その回転走査系によって光源から出射された光ビームを放射状に投光して情報入力領域を形成する光学ユニット７０を用いるものである。なお，光学ユニット７０についての説明は，第３の座標入力装置３Ｃで説明したのでここでは省略する。

【０１１４】このような光学ユニット７０を第２の座標入力装置３Ｂで用いた光学ユニット２７に代えて適用した座標入力装置３Ｄについて説明する。図１５に示すように，情報入力領域３ａ中の或る位置に指示部材６１が挿入された場合，所定のビーム光が指示部材６１の再帰性反射部材６２において再帰反射され，そのビーム光は受光素子７５に到達する。このように情報入力領域３ａ中の或る位置に指示部材６１が挿入されてあるビーム光が再帰反射された場合，受光素子７５からの光の強度分布の形状にはピークが出現する。

【０１１５】各部の電気的接続等については技術的に公知であるため詳細な説明は省略するが，図１６に示すように，情報入力領域３ａに指示部材６１が挿入されていない場合には光強度は＂Ｉ＝ｉ₀＂を示すが，情報入力領域３ａに指示部材６１が挿入されて受光素子７５に再帰光が到達した場合には光強度は＂Ｉ＝ｉ₁＂を示すことになる。このように光強度が＂ｉ＝Ｉ₁＂である部分が，ピークである。なお，図１６中，時間ｔ＝ｔ₀は，ポリゴンミラー７３の回転の基準位置であって，回転走査されるビーム光が所定の角度に達した時点である。

【０１１６】したがって，光強度が＂Ｉ＝ｉ₁＂となった時間ｔをｔ₁であるとすれば，情報入力領域６３に挿入された指示部材６１により再帰反射されたビーム光の出射角度θは，

$\theta = \omega(t_1 - t_0) = \omega\Delta t$

として算出される。つまり，左右それぞれに設けられた光学ユニット７０（７０Ｌ，７０Ｒ）において情報入力領域３ａに挿入された指示部材６１により再帰反射されたビーム光の出射角度θ（θｎＬ，θｎＲ）が算出され，それらの出射角度θ（θｎＬ，θｎＲ）に基づく三角測量の手法によって指示部材６１を挿入した位置座標（ｘ，ｙ）が算出されることになる。

【０１１７】このようにして算出された指示部材６１の位置座標（ｘ，ｙ）は，コントローラ１０を介してコンピュータ５へと出力され，所定の処理に用いられることになる。

【０１１８】そして，このような座標入力装置３Ｄによれば，情報入力領域３ａにおいて，無視差，完全透明，高い描画感を実現することが可能になっている。

【０１１９】Ｅ．第５の座標入力装置

次に，第５の座標入力装置３Ｅについて図１７～図１８に基づいて説明する。この第５の座標入力装置３Ｅは，情報入力領域内の画像情報を撮像カメラにより取り込んで，その取り込まれた画像情報の内の一部に基づいて位置座標を検出するいわゆるカメラ撮像方式の座標入力装置である。

【０１２０】ここで，図１７は第５の座標入力装置３Ｅの構成を概略的に示す正面図である。第５の座標入力装置３Ｅにおける情報入力領域３ａの上方両端部には，撮像手段である撮像カメラ８２が距離ｗを隔てて設けられている。撮像カメラ８２には，ＣＣＤ（Charge Coupled Device）である受光素子８３と結像光学レンズ８４とが，距離ｆを隔てて設けられている。これらの撮像カメラ８２の撮像画角は約９０度であり，情報入力領域３ａを撮影範囲とするようにそれぞれ設置されている。また，撮像カメラ８２は座標入力面を形成するＰＤＰ２の画面２ａから所定の距離となるように設置されており，その光軸はＰＤＰ２の画面２ａに平行である。

【０１２１】加えて，情報入力領域３ａの上部を除く周縁部であって撮像カメラ８２の撮像画角を妨げずに撮影視野全体を覆う位置には，背景板８５が設けられている。この背景板８５は，情報入力領域３ａの中央にその面を向け，ＰＤＰ２の画面２ａに対して略垂直に設けられる。この背景板８５は，例えば一様な黒色とされている。

【０１２２】撮像カメラ８２の信号と指示部材Ｐとの関係を図１８に示す。図１８に示すように，指示部材Ｐが情報入力領域３ａに挿入された場合，その指示部材Ｐは撮像カメラ８２に撮影され，指示部材Ｐの像が撮像カメラ８２の受光素子８３上に形成される。第５の座標入力装置３Ｅのように背景板８５が黒色であって，指を指示

部材Ｐとして用いるような場合には、指示部材Ｐは背景板８５に比べて高い反射率を有することになるので、受光素子８３の指示部材Ｐに相当する部分は、光強度の強い領域（明点）となる。

【０１２３】各部の電気的接続等については技術的に公知であるため詳細な説明は省略するが、図１８に示すように、情報入力領域３ａに指示部材Ｐが挿入された場合には、受光素子８３からの光の強度分布の形状にはピークが出現する。このピークが出現する位置Ｄｎは、結像光学レンズ８４の主点からの指示部材Ｐの見かけの角度θｎに対応しており、θｎはＤｎの関数として、

θｎ＝arctan（Ｄｎ／ｆ）

と表すことができる。つまり、このようなカメラ撮像方式の第５の座標入力装置３Ｅの場合も、前述した座標入力装置３Ａ等と同様に、光強度の波形に出現するピークに基づく三角測量の手法により指示部材Ｐの位置座標（ｘ、ｙ）が算出されることになる。

【０１２４】このようにして算出された指示部材Ｐの位置座標（ｘ，ｙ）は、コントローラ１０を介してコンピュータ５へと出力され、所定の処理に用いられることになる。

【０１２５】なお、指示部材Ｐとしては、自身が発光する発光素子付きの専用ペン等も適用することができる。

【０１２６】そして、このような第５の座標入力装置３Ｅによれば、情報入力領域３ａにおいて、無視差、完全透明、高い描画感を実現することが可能になっている。

【０１２７】続いて、本実施の形態の情報入出力システム１において実行される各種アプリケーションプログラム２４の１つである描画ソフトにおける処理の内、従来の情報入出力システムによって行なわれている処理と同様の処理についてはその説明を省略し、情報入出力システム１が備える特長的な機能に関連する機能について以下に説明する。

【０１２８】図１９に示すように、描画ソフトでは、ユーザによる各種機能の操作を可能とするツールバー９１，９２が表示される。そして、このツールバー９１，９２に含まれるアイコン９３が表示されている位置を手指などで指し示すと、座標入力装置３が、その位置の座標を検出してアイコン９３がクリックされるので、様々な操作が可能となる。

【０１２９】しかしながら、画面２ａは４０インチあるいは５０インチというような大画面であり、また、ツールバー９１，９２は、通常、画面２ａの上下又は左右の端に表示するものであるから、ユーザ[illegible]は、アイコン９３をクリックするためにいちいち四肢を大きく伸ばしたり、所望のアイコン９３が表示されている位置まで歩み寄ったり、あるいは、椅子に座って操作する場合にはアイコン９３をクリックするたびにわざわざ立ち上がったりすることが必要となり、操作が煩雑である。

【０１３０】そこで、描画ソフトでは、以下に説明するような各種の処理を行って、操作性を向上させている。

すなわち、描画ソフトは、ユーザが手指などで画面２ａ上で様々な操作を行なうことに対応して、様々な操作画像を画面２ａ上に表示する。

【０１３１】ここで、操作画像とは、画面上に表示される図形であって、その図形に対してユーザが手指などで所定の動作を行なうことにより、ユーザが様々な操作（この例では、描画ソフトに関する様々な操作）を情報入出力システム１に対して行なうことを受付けるものである。

【０１３２】すなわち、ユーザが手指などを用い画面２ａ上で行なう動作の違いを検出し、その動作ごとに異なる操作画像を画面２ａ上に表示し、その表示した操作画像を介してユーザから様々な操作を受付けるものである。

【０１３３】図２０は、かかる処理に一例ついて説明するフローチャートである。図２０に示すように、手指などで画面２ａ上の２点、ポイントＰａ及びＰｂ（図２１参照）を同時に指し示したことを座標入力装置３により検出したとき（ステップＳ１のＹ）、又は、画面２ａ上の１点、ポイントＰａを指し示したことを座標入力装置３により検出し（ステップＳ２のＹ）、この検出後、予め設定されている一定時間Ｔ以内に（ステップＳ３のＮ）、ポイントＰａ（図２１参照）を指し示された状態のまま、他のポイントＰｂ（図２１参照）も同時に指し示されたことを座標入力装置３により検出したときは（ステップＳ４のＹ）、その検出したポイントＰａとポイントＰｂとの座標位置の距離を算出し（ステップＳ５）、その距離が予め設定されている距離ｄ以下であるときは（ステップＳ６のＹ）、この描画ソフトで使用されている各種アイコン９３のうち、予めハードディスク１に格納された描画ソフトに含まれている操作画像の一例としてのアイコン９４（図２２参照）をポイントＰｂの近傍の予め設定されている所定領域に表示する（ステップＳ７）。ステップＳ７により操作画像表示手段、操作画像表示処理を実現している。ステップＳ３により計時手段、計時処理、第１の比較手段、第１の比較処理を実現している。ステップＳ５により測距手段、測距処理、ステップＳ６により第２の比較手段、第２の比較処理を実現している。

【０１３４】図２２の例では、アイコン９４として、ラインツールアイコン９４ａ、イレーサーアイコン９４ｂ及びスタンプアイコン９４ｃの３つを同時に表示する例を示している。これらのアイコン９４が表示されると、アイコン９４と同様、アイコン９４が表示されている位置を手指などで指し示すと、座標入力装置３がその位置の座標を検出して、アイコン９４がクリックされるので、様々な操作が可能となる。

【０１３５】例えば、図２２に示すアイコン９４の例では、ラインツールアイコン９４ａは画面２ａ上にライン

を描画する機能のアイコンであり、イレーサーアイコン９４ｂは画面２ａ上の画像を消去する機能のアイコンであり、スタンプアイコン９４ｃは"機密""マル秘"などの文字やマークを画面２ａ上に表示する機能のアイコンである。より具体的に説明すると、ラインツールアイコン９４ａをクリックすることにより、画面２ａ上を手指などでなぞった軌跡を座標入力装置３で検出して、その軌跡にラインを表示することができる。また、イレーサーアイコン９４ｂをクリックすることにより、画面２ａ上を手指などでなぞった軌跡を座標入力装置３で検出して、その軌跡上の画像を消去することができる。さらに、スタンプアイコン９４ｃをクリックすることにより、画面２ａ上の手指などで指示した位置に"機密""マル秘"などの文字やマークを表示することができる。

【０１３６】このように、手指などで２点、ポイントＰａ、Ｐｂを同時に指し示すことにより、ポイントＰｂの近傍の予め設定されている位置に所定のアイコン９４を表示することができるので、ユーザ側は、アイコン９４をクリックするためにいちいち四肢を大きく伸ばしたり、所望のアイコン９４が表示されている位置まで歩み寄ったり、あるいは、椅子に座って操作する場合にはアイコン９４をクリックするたびにわざわざ立ち上がったりなど煩わしい動作を行なわなくても、手元にアイコン９４を表示することができ、操作性を向上することができる。

【０１３７】アイコン９４を表示するためには、手指などで画面２ａの２点を同時に指し示した場合のみ（ステップＳ１のＹ、Ｓ２のＹ、Ｓ４のＹ）、アイコン９４を表示するので（ステップＳ７）、ラインツールアイコン９４ａの機能により手指などでなぞった軌跡をライン表示する場合や、イレーサーアイコン９４ｂの機能により手指などでなぞった軌跡上の画像を消去する場合のように、画面２ａ上の１点のみ指し示される場合とは容易に区別される。

【０１３８】また、一定時間Ｔ以内に２点、ポイントＰａ、Ｐｂを同時に指し示す必要があるので（ステップＳ３のＮ）、ある程度の時間を空けて画面２ａ上の２点を指し示すようにすれば、アイコン９４を表示するため以外の目的である程度時間差を置いて２点を指し示す場合を区別することができる。

【０１３９】さらに、ポイントＰａ、Ｐｂ間の距離が距離ｄ以下でないと（ステップＳ６のＹ）、アイコン９４は表示されないので、距離ｄを片手の２本の指で指し示し得ると通常考えられる距離に設定しておけば、アイコン９４を表示するため以外の目的である程度距離をおいて２点を指し示す場合を区別することができる。

【０１４０】なお、アイコン９４として表示するアイコンの種類及び数、表示位置（ポイントＰａとＰｂのいずれを基準とした位置かの別、ポイントＰａ又はＰｂからの距離、方向、範囲）などは、画面２ａ上に表示する操作画面で予め設定しておくことができる。これにより受付手段、受付処理を実現する。そして、この設定がなされると、設定後のアイコン９４の種類及び数、表示位置で前記の所定のテーブルの内容が更新され、以後、その内容にしたがってアイコン９４が表示される。これにより更新手段、更新処理を実現する。

【０１４１】この場合、これらの項目を個別のユーザごとにテーブルに登録しておくこともできる。そして、各ユーザの識別は、様々な認証技術を用いて行なうことができる。例えば、ユーザの氏名やＩＤを画面２ａ上で入力する（又は選択する）、あるいは、ユーザの指紋を読み取り、これを予め登録済みの指紋と照合する（詳細については、例えば、特開2000-187419公報、特開2000-187420公報など参照）などである。さらに、ポイントＰａ、Ｐｂが画面２ａ上の上端側にあるときはアイコン９４を下側に、下端側にあるときは上側に表示し、ポイントＰａ、Ｐｂが画面２ａ上の右端側にあるときはアイコン９４を左側に、左端側にあるときは右側に表示するようにすることもできる。

【０１４２】前記の例では、ポイントＰａ、Ｐｂの２点を画面２ａ上で指し示した場合にアイコン９４を表示するようにしているが、画面２ａ上の３点以上を指し示した場合にアイコン９４を表示するようにしてもよい。この場合に、何点を指し示したかにより、表示するアイコン９４の種類を変えるようにしてもよい。これにより、例えば、画面２ａ上で２点を指し示した場合にはユーザにとって使用頻度の最も高いアイコン９４を表示し、それが３点、４点と増えるにしたがって、順次、使用頻度の低いアイコン９４を表示するようにすることが可能となり、手指しで表示できるアイコン９４の種類を増やし、その表示の切替えを容易に行なえるので、更に操作性を向上させることができる。

【０１４３】ところで、このような処理を行なうためには、画面２ａ上で指し示した２点（ポイントＰａ、Ｐｂ）の座標を同時に検出できるようにする必要がある。そこで、前述した座標入力装置３を用い、ポイントＰａ、Ｐｂの座標を同時に検出するための技術についても説明しておく。

【０１４４】すなわち、再帰光遮蔽方式の座標入力装置３Ａを例に説明すると、図２３に示すように、情報入力領域３ａ内に指示部材Ａ、Ｂを同時に挿入した場合には、光学ユニット２７（左側光学ユニット２７Ｌ、右側光学ユニット２７Ｒ）のＣＣＤ（受光素子）３９上に２箇所の光強度の弱い領域（暗点）が、それぞれ生じてしまうことによる。つまり、位置座標は前述したようにX_nＬ、X_nＲの関数として算出されることから、２つの指示部材Ａ，Ｂを情報入力領域３ａ内に同時に挿入した場合には、指示部材Ａと右側光学ユニット２７Ｒとのなす角度θR_1と指示部材Ｂと右側光学ユニット２７Ｒと

のなす角度θＲ$_2$とが算出されるとともに、指示部材Ａと左側光学ユニット２７Ｌとのなす角度θＬ$_1$と指示部材Ｂと左側光学ユニット２７Ｌとのなす角度θＬ$_2$とが算出され、合計４つの位置座標が算出されることになる。

【０１４５】しかしながら、このように２つの指示部材によって情報入力領域３ａ内が同時に指示されて合計４つの位置座標が算出された場合であっても、２つの指示部材によって指示された位置座標を検出することは可能である。以下において、算出された複数個の位置座標の中から複数の指示部材による実際の遮蔽点（反射点）の位置座標を判定する実像判定処理について説明する。

【０１４６】ここで、図２４は実像判定処理を含む処理の流れを概略的に示すフローチャート、図２５は情報入力装置３Ａにおける複数個の位置座標が算出される状態を示す説明図である。なお、図２１において、"Ａ１，Ａ２，Ａ３，Ａ４"は一方の指示部材で指示した実像の座標軌跡、"Ｂ１，Ｂ２，Ｂ３，Ｂ４"は他方の指示部材で指示した実像の座標軌跡を示すものである。また、"Ｃ１，Ｃ２，Ｃ３，Ｃ４"および"Ｄ１，Ｄ２，Ｄ３，Ｄ４"は、虚像である。

【０１４７】本実施の形態においては、座標が算出されると、まず、算出座標が５つ以上であるか否かが判断される（図２４に示すステップＳ１４）。算出座標が５つ以上である場合には（図２４に示すステップＳ１４のＹ）、３以上の指やペン等の指示部材が情報入力領域３ａ内に同時に挿入されたものであるため、以後の判断は行なわない。

【０１４８】一方、算出座標が５つ以上でない場合には（図２４に示すステップＳ１４のＮ）、情報入力領域３ａ内に挿入された指示部材は１つまたは２つであることから、続くステップＳ１５において、算出座標が１つであるか否かが判断される。

【０１４９】例えば指示部材が情報入力領域３ａ内に同時に２つ挿入され、４つの位置座標（図２５に示すＡ１，Ｂ１，Ｃ１，Ｄ１）が算出された場合、算出座標が１つではないので（ステップＳ１５のＮ）、複数個の位置座標の中から複数の指示部材による実際の遮蔽点の位置座標を抽出する座標抽出処理が実行される。なお、特に図示しないが、指示部材が情報入力領域３ａ内に同時に２つ挿入された場合において、その挿入位置が一の光学ユニット２７対して一直線上に並ぶ場合には、算出される位置座標は２つである。

【０１５０】座標抽出処理としては、まず、算出された複数個の位置座標（Ａ１，Ｂ１，Ｃ１，Ｄ１）をＲＡＭ１４等のメモリに記憶する（ステップＳ１６）。

【０１５１】続くステップＳ１７においては、メモリに記録された複数個の位置座標（Ａ１，Ｂ１，Ｃ１，Ｄ１）の内、実像として確定した位置座標が有るか否かが判定される。

【０１５２】実像として確定した位置座標が無い場合には（ステップＳ１７のＮ）、ステップＳ１８に進み、実像判定に必要な時系列的に順次得られる複数回分の算出座標がメモリに記憶されているか否かを判定する。

【０１５３】複数回分の算出座標がメモリに記憶されている場合には（ステップＳ１８のＹ）、ベクトル長・変位長・変位方向の初期判定条件（実験値）を設定した後（ステップＳ１９）、ステップＳ２０に進み、実像判定処理を実行する。

【０１５４】ここで、図２６は実像判定処理の流れを概略的に示すフローチャートである。実像判定処理は、図２６に示すように、まず、ステップＳ５１において、所定の算出座標を起点座標とし、座標間の座標ベクトル値及び座標ベクトル長を算出して、サンプリングされた位置座標毎にＲＡＭ１４等のメモリに記憶する。

【０１５５】ここで、座標ベクトル値の算出方法について図２７を参照して説明する。図２７において、前回検出された位置座標を（Ｘ１、Ｙ１）、今回得られた位置座標を（Ｘ２、Ｙ２）とする。Ｘ座標方向の変化量△Ｘ＝Ｘ２－Ｘ１、Ｙ座標方向の変化量△Ｙ＝Ｙ２－Ｙ１から、座標ベクトル値を△Ｙ／△Ｘにより算出する。この場合の座標ベクトル値は、図２８に示すＲＡＭ４２に格納されるベクトルテーブルＴＢに、Ｘ軸方向から１０度間隔で数値化されて予め格納されている。なお、この間隔（１０度）は任意に設定すればよい。また、座標ベクトル値は、算出結果の近似値を用いるものとする。例えば、－△Ｙ，－△Ｘで△Ｙ／△Ｘ＝０．９００の場合であれば、座標ベクトル値＝２４となる。

【０１５６】また、図２７において示すように、各サンプリングにおける座標間の座標ベクトル値は上述のように算出され、各座標間の座標ベクトル長Ｌは、例えば、座標（Ｘ１，Ｙ１），（Ｘ２，Ｙ２）間の座標ベクトル長Ｌ１であれば、

$$L1=\sqrt{\{(Y2-Y1)^2+(X2-X1)^2\}}$$

により算出される。このようにして、サンプリングされた位置座標毎にその座標ベクトル値とその座標ベクトル長とがそれぞれ算出される。

【０１５７】つまり、ステップＳ５１においては、時系列的に順次得られる位置座標間の変化する方向とその変化分を示す長さについて、ベクトルテーブルＴＢに予め設定格納されているベクトルデータを用いてベクトル座標化する処理を実行するものである。

【０１５８】続いて、ステップＳ５２に進み、ステップＳ５１で算出した座標ベクトル長が、座標検出周期（サンプリング信号に伴う所定の時間間隔）内において移動不可能な異常な座標ベクトル長（異常ベクトル長）であるか否かが判定される。なお、本実施の形態における座標検出周期は、２０ｍｓとする。つまり、ステップＳ５２は、ステップＳ５１で算出した座標ベクトル長が座標検出周期（２０ｍｓ）内に検出される長さより長い場合

には、実際には移動不可能であることから、その座標軌跡は、異常な座標ベクトル長（異常ベクトル長）であって実像軌跡ではないものと判定するものである。

【０１５９】座標ベクトル長が異常ベクトル長である場合には（ステップＳ５２のＹ）、ステップＳ５３に進み、異常ベクトル長を判定した座標ベクトル長の数が検知された位置座標数に達したか否かが判定され、検知された位置座標数に達していなければ（ステップＳ５３のＮ）、終点の位置座標を変更して（ステップＳ５４）、再びステップＳ５１においてその終点に基づく座標ベクトル値と座標ベクトル長とを算出する。

【０１６０】つまり、ステップＳ５１～Ｓ５２の処理は、座標ベクトル長が異常ベクトル長でないと判定されるまで（ステップＳ５２のＮ）、または、全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定されるまで（ステップＳ５３のＹ）、繰り返される。

【０１６１】したがって、例えば位置座標Ａ１を起点座標とした場合について説明すると、図２５に示すようにその直後に算出される位置座標はＡ２，Ｂ２，Ｃ２，Ｄ２であることから、これらの位置座標（Ａ２，Ｂ２，Ｃ２，Ｄ２）の中から一つずつ位置座標が終点として選択され、

Ａ１→Ａ２，Ａ１→Ｂ２，Ａ１→Ｃ２，Ａ１→Ｄ２

の何れか一つに係る座標ベクトル値（起点ベクトル値）とその座標ベクトル長（起点ベクトル長）とが順次算出され、実像軌跡であるか否かが順次判定されることになる。

【０１６２】なお、全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定された場合には（ステップＳ５３のＹ）、実像の確定ができないことになるので、後述するステップＳ２１に進む。

【０１６３】一方、座標ベクトル長が異常ベクトル長でないと判定された場合には（ステップＳ５２のＮ）、その終点の位置座標をＲＡＭ１４等のメモリに記憶し（ステップＳ５５）、所定の初期設定（ｎ＝３（ｎ：座標検出周期回数））を実行する（ステップＳ５６）。

【０１６４】続くステップＳ５７においては、ステップＳ５５においてメモリに記憶した起点ベクトルの終点の位置座標を起点座標とし、ｎ番目の座標検出周期において検出された位置座標との座標間の座標ベクトル値及び座標ベクトル長を算出し、ＲＡＭ１４等のメモリに記憶する。

【０１６５】続いて、ステップＳ５８に進み、ステップＳ５７で算出した座標ベクトル長が、座標検出周期内において移動不可能な異常な座標ベクトル長（異常ベクトル長）であるか否かを判定する。

【０１６６】座標ベクトル長が異常ベクトル長でないと判定された場合には（ステップＳ５８のＮ）、ステップＳ５９に進み、実像軌跡であるものとされたＡ１→Ａ２の座標軌跡とＡ２→Ａ３の座標軌跡とを比較し、座標ベクトル値が特定の変位量（Ｖ）内にあり、且つ、座標ベクトル長が特定の変位量（Ｌ）外である軌跡（異常変位長）であるか否かを判定する。

【０１６７】このように座標ベクトル値が特定の変位量（Ｖ）内にあり、且つ、座標ベクトル長が特定の変位量（Ｌ）外である軌跡（異常変位長）であるか否かを判定するのは、図２９に示すように、一般的に直線を描く場合には、座標ベクトル値、同一時間内における座標ベクトル長はほぼ同じであり、また、特に図示しないが、曲線を描く場合においても、座標ベクトル値は変化するが変化量は略同一であって座標ベクトル長も略同一となることに起因している。つまり、直線または曲線上に検出物が移動する場合には、座標ベクトル長および座標ベクトル値に大きな差は生じないことから、座標ベクトル値が特定の変位量（Ｖ）内であっても、座標ベクトル長が特定の変位量（Ｌ）外である軌跡（異常変位長）については、排除するものである。

【０１６８】異常変位長でないと判定された場合には（ステップＳ５９のＮ）、ステップＳ６０に進み、実像軌跡であるものとされたＡ１→Ａ２の座標軌跡とＡ２→Ａ３の座標軌跡とを比較し、座標ベクトル値が特定の変位量（Ｖ）外にあり、且つ、座標ベクトル長が減少している軌跡（異常変位方向）であるか否かを判定する。

【０１６９】このように座標ベクトル値が特定の変位量（Ｖ）外にあり、且つ、座標ベクトル長が減少している軌跡（異常変位方向）であるか否かを判定するのは、図３０に示すように、一般的に直線方向を大きく変化させて描く場合には、方向転換する描画速度は順次低減して方向転換点で停止状態となり、再び転換方向に通常の速度で描きはじめることになるので、座標ベクトル値が大きく変化する場合には、座標ベクトル長は逐次減少した後、変換方向に向かって増加することに起因している。つまり、検出物が大きく方向を変える場合には、直前に動作の停止状態が発生することから、座標ベクトル長が減少していても、座標ベクトル値が特定の変位量（Ｖ）外である軌跡（異常変位方向）については、排除するものである。

【０１７０】異常変位方向でないと判定された場合（ステップＳ６０のＮ）、言い換えれば異常ベクトル長でも異常変位長でも異常変位方向でもない場合には、その終点の位置座標をＲＡＭ１４等のメモリに記憶し（ステップＳ６１）、座標検出周期回数ｎを“１”インクリメントする（ステップＳ６２）。

【０１７１】その後、ステップＳ６３において、座標検出周期回数ｎがメモリに記憶されている実像判定に必要な時系列的に順次得られる複数回分の算出座標の数（判定座標数）を超えたか否かが判定され、座標検出周期回数ｎが判定座標数を超えていない場合には（ステップＳ６３のＹ）、前述した継続ベクトルを起点ベクトルとし

（ステップＳ６４），再びステップＳ５７においてその終点に基づく座標ベクトル値と座標ベクトル長とを算出する。

【０１７２】つまり、ステップＳ５７～Ｓ６４の処理は，全ての終点の位置座標について異常ベクトル長または異常変位長若しくは異常変位方向であると判定されるまで（ステップＳ６５のＹ），終点の位置座標を変更し（ステップＳ６６），繰り返される。

【０１７３】そして，全ての終点の位置座標について異常ベクトル長または異常変位長若しくは異常変位方向であると判定された場合には（ステップＳ６５のＹ），再びステップＳ５４に進み，終点の位置座標を変更し，ステップＳ５１においてその終点に基づく座標ベクトル値と座標ベクトル長とを算出する。

【０１７４】したがって，例えば，ステップＳ５５においてメモリに記憶した起点ベクトルの終点の位置座標がＡ２であって，Ａ１→Ａ２が実像軌跡であるものとされた場合，図２５に示すようにその直後に算出される位置座標はＡ３，Ｂ３，Ｃ３，Ｄ３であることから，これらの位置座標（Ａ２，Ｂ２，Ｃ２，Ｄ２）の中から一つずつ位置座標が終点として選択され，

Ａ２→Ａ３，Ａ２→Ｂ３，Ａ２→Ｃ３，Ａ２→Ｄ３

の何れか一つに係る座標ベクトル値（継続ベクトル値）とその座標ベクトル長（継続ベクトル長）とが順次算出され，実像軌跡であるか否かが順次判定されることになる。

【０１７５】一方，座標検出周期回数ｎが判定座標数を超えたと判定された場合には（ステップＳ６３のＹ），実像が確定したことになるので，その位置座標をインターフェイス４３を介してコンピュータ５に転送し（ステップＳ６７），指示部材による指示位置の表示や指示位置に対応するコマンド入力などの処理に利用することになる。

【０１７６】ここで，一の位置座標に基づく他の位置座標についての実像か否かの判定について図２３を参照して説明する。一の位置座標に基づく他の位置座標についての実像か否かの判定は，図２３において，ＡとＡ´とがいずれも実像であるものとすると，②の方向には座標は検出されないことになる。このため，ＡとＡ´とのいずれか一方が実像であることがわかる。また，同様に，ＢとＢ´とのいずれか一方が実像であることがわかる。つまり，同一方向に存在する位置座標は，何れか一方のみが実像であって，他方は虚像であることになる。また，一方のＡが実像であるとわかった場合には，他方のＡ´は虚像として認識されるとともに，③方向のＢ´も虚像として認識されることになるので，Ｂが実像であることがわかる。つまり，メモリに記憶された四つの位置座標の内，一の位置座標について実像か虚像かが認識されれば，全ての位置座標についての実像か虚像かの判定が可能であることがわかる。したがって，算出された全ての位置座標について実像判定を行なう必要はないので，複数箇所を同時に指示した場合の位置座標を低コストで検出することが可能になる。

【０１７７】なお，図３１に示すように，メモリに記憶された複数個の位置座標（Ａ１，Ｂ１，Ｃ１，Ｄ１）の内，一の位置座標（図３１においてはＢ１）が情報入力領域３ａの外に存在してしまう場合には，Ａ１とＣ１とを実像として確定することができることになる。

【０１７８】すなわち，メモリに記憶された四つの位置座標の内，一の位置座標について実像か虚像かが認識されれば，全ての位置座標についての実像か虚像かの判定が可能であることにより，他方の位置座標も実像として確定し（ステップＳ６８），インターフェイス４３を介してコンピュータ５に転送する（ステップＳ６９）。また，ステップＳ６７～Ｓ６９の処理は，判定座標数全てについて確定するまで（ステップＳ７０のＹ），繰り返される。そして，判定座標数全てについての実像の位置座標の送信が終了した場合に（ステップＳ７０のＹ），実像判定処理は終了し，ステップＳ１４に戻る。

【０１７９】次に，ステップＳ５３において全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定された場合の処理について説明する。全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定された場合には（ステップＳ５３のＹ），前述したように実像の確定ができないものとしてステップＳ２１に進むが，このステップＳ２１においては，まだ同一方向の位置座標（例えば，図２５においてＡ１に対するＣ１）についての実像判定処理を実行しているかいないかを判定する。まだ同一方向の位置座標についての実像判定処理を実行していない場合には（ステップＳ２１のＮ），起点座標を変更して（ステップＳ２２），再度ステップＳ２０に進み，実像判定処理を実行する。一方，同一方向の位置座標についての実像判定処理を実行している場合には（ステップＳ２１のＹ），ステップＳ１９で設定したベクトル長・変位長・変位方向の判定条件を変更し（ステップＳ２３），再度ステップＳ２０に進み，実像判定処理を実行する。つまり，同一方向の２点の位置座標について，交互に同条件にて実像判定を繰り返すことになる。

【０１８０】また，算出された位置座標が１つである場合には（ステップＳ１５のＹ），その算出された位置座標をインターフェイス４３を介してコンピュータ５に転送するとともに（ステップＳ２４），ＲＡＭ１４等のメモリに記憶し（ステップＳ２５），ステップＳ１４に戻る。

【０１８１】次に，ステップＳ１７において，実像として確定した位置座標が有ると判定された場合について説明する。実像として確定した位置座標が有る場合には（ステップＳ１７のＹ），ステップＳ２６に進む。

【０１８２】ここで，実像として確定した位置座標が有

る場合とは、前述したように算出された位置座標が複数ではない場合の位置座標がＲＡＭ１４等のメモリに複数記憶されている場合であって、例えば図３２に示すような場合である。図３２は、一の指示部材で記述している途中において、他の指示部材が情報入力領域３ａ内に挿入された状態を示している。なお、実像として確定した位置座標が有る場合とは、前述したような処理により２点の座標が確定している場合を含むことは言うまでもない。

【０１８３】ステップＳ２６においては、実像として確定した位置座標の前回および前々回の値に基づき、座標間の座標ベクトル値（実像ベクトル値）及び座標ベクトル長（実像ベクトル長）を算出して、ＲＡＭ１４等のメモリに記憶する。

【０１８４】その後、ベクトル長・変位長・変位方向の初期判定条件（実験値）を設定した後（ステップＳ２７）、ステップＳ２６においてメモリに記憶した実像ベクトルの終点の位置座標を起点座標とし、複数個同時に検出された位置座標との座標間の座標ベクトル値及び座標ベクトル長を算出し、ＲＡＭ１４等のメモリに記憶する。

【０１８５】続いて、ステップＳ２９に進み、ステップＳ２８で算出した座標ベクトル長が、座標検出周期内において移動不可能な異常な座標ベクトル長（異常ベクトル長）であるか否かを判定する。

【０１８６】座標ベクトル長が異常ベクトル長でないと判定された場合には（ステップＳ２９のＮ）、ステップＳ３０に進み、実像軌跡であるものとされたＡ３→Ａ４の座標軌跡と例えばＡ４→Ａの座標軌跡とを比較し、座標ベクトル値が特定の変位量（Ｖ）内にあり、且つ、座標ベクトル長が特定の変位量（Ｌ）外である軌跡（異常変位長）であるか否かを判定する。

【０１８７】異常変位長でないと判定された場合には（ステップＳ３０のＮ）、ステップＳ３１に進み、実像軌跡であるものとされたＡ３→Ａ４の座標軌跡と例えばＡ４→Ａの座標軌跡とを比較し、座標ベクトル値が特定の変位量（Ｖ）外にあり、且つ、座標ベクトル長が減少している軌跡（異常変位方向）であるか否かを判定する。

【０１８８】異常変位方向でないと判定された場合（ステップＳ３１のＮ）、言い換えれば異常ベクトル長でも異常変位長でも異常変位方向でもない場合には、その終点の位置座標をＲＡＭ１４等のメモリに記憶し（ステップＳ３２）、その位置座標をインターフェイス４３を介してコンピュータ５に転送するとともに（ステップＳ３３）、他方の位置座標も実像として確定し（ステップＳ３４）、インターフェイス４３を介してコンピュータ５に転送する（ステップＳ３５）。

【０１８９】一方、座標ベクトル長が異常ベクトル長であると判定された場合（ステップＳ２９のＹ）、異常変位長であると判定された場合（ステップＳ３０のＹ）、異常変位方向であると判定された場合には（ステップＳ３１のＹ）、検出座標数に達するまで（ステップＳ３６のＹ）、検出座標を変更し（ステップＳ３７）、ステップＳ２８～Ｓ３１の処理を繰り返す。

【０１９０】したがって、例えば、ステップＳ２６においてメモリに記憶した実像ベクトルの終点の位置座標がＡ４である場合、図３２に示すようにその直後に算出される位置座標はＡ，Ｂ，Ｃ，Ｄであることから、これらの位置座標（Ａ，Ｂ，Ｃ，Ｄ）の中から一つずつ位置座標が終点として選択され、Ａ４→Ａ、Ａ４→Ｂ、Ａ４→Ｃ、Ａ４→Ｄの何れか一つに係る座標ベクトル値（軌跡ベクトル値）とその座標ベクトル長（軌跡ベクトル長）とが順次算出され、実像軌跡であるか否かが順次判定されることになる。つまり、実像であると判定された一の位置座標の軌跡を追跡することで、受光素子に対して同一方向に位置する他の位置座標を虚像であると認識し、他の実像である位置座標を確定するものである。

【０１９１】また、検出座標数に達した場合には（ステップＳ３６のＹ）、ステップＳ２７で設定したベクトル長・変位長・変位方向の判定条件を変更し（ステップＳ３８）、再度ステップＳ２８に進み、座標ベクトル値（軌跡ベクトル値）とその座標ベクトル長（軌跡ベクトル長）とを算出する。

【０１９２】以上のような処理により、２つの指示部材によって情報入力領域３ａ内が同時に指示されて合計４つの位置座標が算出された場合であっても、２つの指示部材によって指示された位置座標を検出することができ、これら２つの位置座標を有効とすることができる。

【０１９３】次に、画面２ａに表示する操作画像の別の例について説明する。

【０１９４】まず、図３３に示すように、画面２ａ上の３点を同時に指し示したときは、その３点の近傍の予め設定されている位置に操作画像であるダイアル１０１を表示する（図３３（ａ））。このダイアル１０１の画像は予めハードディスク１７の描画ソフトに含まれているものである。そして、画面２ａ上の指し示している３点の位置を移動し、ダイアル１０１を回す操作をすると、ダイアル１０１の画像も回転移動して、ダイアル１０１を回転操作することができる（図３３（ｂ））。このダイアル１０１は、回転操作することで、情報入出力システム１に対する所定の操作を行なうことを可能とする。この例では、操作画像がダイアルであるため、情報入出力システム１で音声を出力する場合の音声ボリュームの調整など、一定の物理量等の段階的又は無段階的な調整に好適である。

【０１９５】このダイアル１０１に関する処理は、具体的には次のようにして行なう。図３４は、この場合の処理を説明するフローチャートである。まず、画面２ａ上の３点が同時に指し示されていることを検出する（ステ

ップＳ７１のＹ）。図２３以下を参照して説明した処理では、画面２ａ上で指し示された３点以上の座標を同時に検出することはできないが、この例では、画面２ａ上の３点が同時に指し示されていることを検出できればよく、その３点の正確な座標は特定できる必要はない。すなわち、図２３以下の例でも、画面２ａ上の３点が指し示されているときには、３点の実像及び６点の虚像の合計９点が検出されるので、これにより、実際に指し示されているのは３点であることは検出できる（その３点の＊

＊正確な位置は検出できなくても）。

【０１９６】図３５の例では、実像の３点Ｐａ、Ｐｂ，Ｐｃ及び虚像の６点Ｇ１～Ｇ６が検出されている。そして、この９点の各座標Ｐａ（ｘａ，ｙａ），Ｐｂ（ｘｂ，ｙｂ），Ｐｃ（ｘｃ，ｙｃ），Ｇ１（ｘ１，ｙ１）～Ｇ６（ｘ６，ｙ６）の中点Ｃの座標を求める（ステップＳ７２）。

【０１９７】すなわち、

$$x0=(xa+xb+xc+x1+x2+x3+x4+x5+x6)/9,$$
$$y0=(ya+yb+yc+y1+y2+y3+y4+y5+y6)/9 \quad \cdots\cdots (6)$$

の演算を行って、中点Ｃの座標（ｘ０，ｙ０）を求める。

【０１９８】そして、この中点Ｃ（ｘ０，ｙ０）の位置を中心として、ダイアル１０１の画像を表示する（ステップＳ７３）。

【０１９９】そして、９点Ｐａ～Ｐｃ，Ｇ１～Ｇ６の中で、位置の移動があったときは（ステップＳ７４のＹ）、図３６に示すように、９点Ｐａ～Ｐｃ，Ｇ１～Ｇ６の中で１点を注目点として特定し（この例では点Ｐａ）、位置の移動の際に注目点に一番近い検出点を、注目点の移動点として（この例では点Ｐａ’として表示）、中点Ｃを円の中心として、注目点Ｐａ（ｘａ，ｙａ）と移動点Ｐａ’（ｘａ’，ｙａ’）の２点から当該円の回転角度θｍを算出する（ステップＳ７５）。ステップＳ７４により移動検出手段、移動検出処理を実現している。

【０２００】すなわち、

移動距離Ｌ＝√（ｘａ’－ｘａ）２＋（ｙａ’－ｙａ）２

半径ｒ＝√（ｘａ－ｘ０）２＋（ｙａ－ｙ０）２

を求めて（図３７も参照）、この結果から、

回転角度θｍ＝（３６０×Ｌ）／（２×π×ｒ）

（但し、πは円周率）

を求める。

【０２０１】そして、回転角度θｍに応じてダイアル１０１の画像を中点Ｃを中心に回転して表示し（ステップＳ７６）。ステップＳ７３、Ｓ７５、Ｓ７６により、操作画像表示手段、操作画像表示処理を実現している。また、回転角度θｍに応じた操作を受付けて実行する（ステップＳ７７）。ステップＳ７７により操作手段、操作処理を実現している。すなわち、前述のようにダイアル１０１が音声ボリュームを操作するときは、回転角度θｍの大きさに応じて音声ボリュームを操作することになる。画面２ａ上の３点が指し示されなくなったときは（ステップＳ７８のＹ）、ダイアル１０１の表示を消去する（ステップＳ７９）。

【０２０２】画面２ａに表示する操作画像の別の例について説明する。

【０２０３】図３８に示すように、片手の５本の指などで画面２ａ上の５点を同時に指し示したときは、その５点の近傍の予め設定されている位置に扉１０２を表示する（図３８（ａ））。そして、そのまま指し示した５点の位置を下方（又は上方）に移動させると、５点の位置の移動に伴って徐々に扉１０２が開き、扉１０２の下に操作画像であるパレット１０３が現れる（図３８（ｂ））。扉１０２、パレット１０３の画像は予めハードディスク１７の描画ソフトに含まれているものである。そして、パレット１０３上でユーザがそれぞれ異なる１点を順次指し示すことにより、パレット１０３上で様々な操作を入力することができる。この例では、まず、扉１０２を表示し、その後、扉１０２の下に操作画像であるパレット１０３を表示するものであるので、画面２ａ上を指し示しただけで直ちに表示させたくはない操作画像、例えば、初期設定値を変更する入力を行なうための操作画像を表示させる場合等に好適である。

【０２０４】このパレット１０３に関する処理は、具体的には次のようにして行なう。図３９は、この場合の処理を説明するフローチャートである。まず、画面２ａ上の５点が同時に指し示されていることを検出する（ステップＳ８１のＹ）。この例でも５点の正確な座標は特定できる必要はなく、画面２ａ上の５点が指し示されているときには、５点の実像及び２０点の虚像の合計２５点が検出されるので、これにより、実際に指し示されているのは５点であることは検出できる。

【０２０５】そして、ここでも（６）と同様の演算を行って、合計２５点の中点Ｃの座標（ｘ０，ｙ０）を求める（図４０参照）（ステップＳ８２）。そして、中点Ｃを中心として扉１０２の画像を画面２ａに表示する（ステップＳ８３）。ステップＳ８３により、扉表示手段、扉表示処理を実現している。

【０２０６】その後、ユーザが指し示している５点の位置を、そのまま下方にドラッグし、５点の位置の移動があったときは（ステップＳ８４のＹ）、中点Ｃの位置も下方に移動するが、そのドラッグ方向と一致するわけではない。ステップＳ８４により、移動検出手段、移動検出処理を実現している。必要なのは下方への移動距離で

あるため、移動前のＣ点の座標を（ｘ０、ｙ０）移動後のＣ点の座標を（ｘ１、ｙ１）とすると、｀ｌ＝ｙ１－ｙ０｀により．下方への移動距離ｌを求め（図４１参照）（ステップＳ８５）．その移動距離ｌ分だけ扉１０２の画像を下げて表示し．また、最初の扉１０２の位置にパレット１０３を表示する（ステップＳ８６）。ステップＳ８６により、扉変更手段、扉変更処理、操作画像表示手段、操作画像表示処理を実現している。このパレット１０３の表示は扉１０２の位置と被らない部分の画像だけを表示し．扉１０２の下から徐々にパレット１０３が出現するかのようにする。

【０２０７】そして、パレット１０３の操作がなされたときは（ステップＳ８７のＹ）、その操作（例えば、前述のように初期設定値の変更）を受付けて実行し（ステップＳ８８）．パレット１０３上でパレット１０３の表示の終了が指示されたときは（ステップＳ８９のＹ）、扉１０２、パレット１０３の表示を終了する（ステップＳ９０）。ステップＳ８８により、操作手段、操作処理を実現している。

【０２０８】画面２ａに表示する操作画像の別の例について説明する。

【０２０９】図４２に示すように、画面２ａ上で同時ではなく順次に３点を同時に指し示したときは、その３点の近傍の予め設定されている位置に操作画像であるパレット１０４を表示する。パレット１０４の画像はハードディスク１７に格納されている描画ソフトに含まれている。この場合には、前述の例のように扉１０２のドラッグによりパレット１０３が徐々に姿をあらわすのではなく．パレット１０４は直ちに表示されるものであるため．画面２ａ上を指し示しただけで直ちに表示させたい操作画像の表示に好適である。

【０２１０】図４３に示すように、この場合の処理は、１点（ポイントＡ）を検出した後（図４４参照）（ステップＳ９１のＹ）、この１点を維持したまま所定時間内に別の１点（ポイントＢ）を検出し（図４５参照）（ステップＳ９２のＹ）、さらに、これら２点を維持したまま別の１点（ポイントＣ）を検出すると（図４６参照）（ステップＳ９３のＹ）．これら３点の近傍の予め設定されている位置にパレット１０４を表示するものである（ステップＳ９４）。ステップＳ９４により操作画像表示手段、操作画像表示処理を実現している。

【０２１１】この場合、前述と同様に３点の実像と６点の虚像の中点を求めて、当該中点の所定方向、所定距離の位置にパレット１０４を表示してもよいが、３点（ポイントＡ，Ｂ，Ｃ）の正確な座標を検出することも容易に行なえるので．その３点の正確な座標からパレット１０４の表示位置を決定するようにしてもよい。

【０２１２】すなわち、図４５に示すように、ポイントＡを指示したままポイントＢを指示すると、ポイントＡ，Ｂ，Ｃ，Ｄが検出されるが、Ａ点は実像であること

が当初からわかっている（図４４）。仮にポイントＣが２点目の実像であるとすると、ポイントＢ，Ｄは検出されないはずで．また、ポイントＤが２点目の実像であるとすると、ポイントＢ，Ｃは検出されないはずであるため．Ｂ点が２点目の実像と判定される。次に、図４６に示すように、ポイントＡ、Ｂが確定しているとすると、仮にポイントＨが３点目の実像であれば、ポイントＩ，Ｆ，Ｄ，Ｃ，Ｅは検出されないので．ポイントＨは虚像と判定される。同様の判断を繰り返して、ポイントＡ，Ｂ，Ｃが実像であると判定される。

【０２１３】パレット１０４の表示（ステップＳ９４）後．パレット１０４の操作がなされたときは（ステップＳ９５のＹ）．その操作（例えば、前述のように初期設定値の変更）を受付けて実行し（ステップＳ９６）、パレット１０４上でパレット１０４の表示の終了が指示されたときは（ステップＳ９７のＹ）．パレット１０４の表示を終了する（ステップＳ９８）。

【０２１４】画面２ａに表示する操作画像の別の例について説明する。

【０２１５】図４７に示すように、画面２ａ上で一点（ポイントＰａ）を指し示し、この状態で２点目（ポイントＰｂ）を指し示して．この２点目の位置を上下に移動すると、２点目の指し示している位置に操作画像であるスライダーバー１０５を表示する。スライダーバー１０５の画像は．ハードディスク１７内の描画ソフトに含まれている。このスライダーバー１０５も、ダイアル１０１の場合と同様、情報入出力システム１で音声を出力する場合の音声ボリュームの調整など．一定の物理量等の段階的又は無段階的な調整に好適である。

【０２１６】図４８に示すように、この場合の処理は、１点（ポイントＡ）を検出した後（図４９参照）（ステップＳ１０１のＹ）、この１点を維持したまま所定時間内に別の１点（ポイントＢ）を検出し（ステップＳ１０２のＹ）、この後、最初の１点（ポイントＡ）の指示を維持したまま２点目（ポイントＢ）の移動を検出したときに（ステップＳ１０３のＹ）、２点目（ポイントＢ）の位置にスライダーバー１０５の画像を表示することで行なう（ステップＳ１０４）。ステップＳ１０３により．移動検出手段、移動検出処理を．ステップＳ１０４により、操作画像表示手段．操作画像表示処理を実現している。

【０２１７】ポイントＡ．Ｂの正確な座標位置の検出は．図２３以下を参照して前述した技術を用いて行なうことができる。これにより．ポイントＡ～Ｄのうち、ポイントＡ，Ｂが実像であると判定することができる。そして．ポイントＢの位置が移動したときに、元のポイントＢの位置の座標を（ｘ０、ｙ０）（図４９参照）、移動後のポイントＢの位置の座標を（ｘ１，ｙ１）（図５０参照）とすると、｀ｌ＝ｙ１－ｙ０｀により．垂直方向の移動距離を求めることができるので、距離ｌだけ全

直方向に移動した位置にスライダーバー１０５の画像を表示することができる。

【０２１８】そして、移動した距離１に応じた操作（音声ボリュームの調整等）を受付けて実行する（ステップＳ１０５）。ステップＳ１０５により、操作手段、操作処理を実現している。その後、ポイントＡ，Ｂの２点同時の検出がなされなくなったときは（ステップＳ１０６のＹ）、スライダーバー１０５の表示を消去する（ステップＳ１０７）。

【０２１９】以上、様々な操作画像の例について説明した。次に、画面２ａ上での指示に応じて、これらの操作画像の別を判断して適切な操作画像を表示するための処理について説明する。

【０２２０】図５１に示すように、画面２ａ上で２点を順次検出して（ステップＳ１１１のＹ）、後に検出した１点を移動させたときは（ステップＳ１１２のＹ）、図４８を参照して前記した処理処理に移行し（ステップＳ１１３）、スライダーバー１０５（図４７参照）を表示する。この場合に、後に検出した１点の移動がないときは（ステップＳ１１２のＮ）、図２０を参照して前記した処理に移行し（ステップＳ１１４）、アイコン９４（図２２参照）を表示する。

【０２２１】画面２ａ上で２点を同時に検出したときも（ステップＳ１１５のＹ）、図２０を参照して前記した処理に移行し（ステップＳ１１４）、アイコン９４（図２２参照）を表示する。

【０２２２】画面２ａ上で３点を順次検出したときは（ステップＳ１１６のＹ）、図４３を参照して前記した処理に移行し（ステップＳ１１７）、パレット１０４を表示する（図４２参照）。

【０２２３】画面２ａ上で３点を同時に検出したときは（ステップＳ１１８のＹ）、図３４を参照して前記した処理に移行し（ステップＳ１１９）、ダイアル１０１を表示する（図３３参照）。

【０２２４】画面２ａ上で５点を同時に検出したときは（ステップＳ１２０のＹ）、図３９を参照して前記した処理に移行し（ステップＳ１２１）、パレット１０３を表示する（図３８参照）。ステップＳ１１１～Ｓ１２１の処理により、操作画像表示手段、操作画像表示処理を実現している。

【０２２５】以下では、その他の操作画像の表示例について簡単に説明する。

【０２２６】図５２に示すように、画面２ａ上で２点（ポイントＡ，Ｂ）を順次指し示したときに、その２点間に操作画像である所定のオブジェクト１０６を表示し、このポイントＡ，Ｂの距離を拡大、縮小させるように、ポイントＡ，Ｂの位置を移動させたときに、その移動距離の大きさに応じて、オブジェクト１０６の大きさを拡大、縮小して表示するようにしてもよい。オブジェクト１０６は、例えば前述したアイコン９４などである。

【０２２７】図５３は、この場合のフローチャートである。すなわち、１点（ポイントＡ）を検出した後（ステップＳ１３１のＹ）、この１点を維持したまま所定時間内に別の１点（ポイントＢ）を検出し（ステップＳ１３２のＹ）、この後、ポイントＡ，Ｂを移動したときは（ステップＳ１３３のＹ）、オブジェクト１０６を表示して（ステップＳ１３４）、ポイントＡとポイントＢとの最初の距離１ａと、移動後の距離１ｂとの差を求め、その距離１ａと距離１ｂとの距離差１ｃを求めて（ステップＳ１３５）、その距離差１ｃの大きさに応じてオブジェクト１０６を拡大、縮小する（ステップＳ１３６）。ステップＳ１３３により、移動検出手段、移動検出処理を、Ｓ１３４により、操作画像表示手段、操作画像表示処理を、ステップＳ１３６により、拡大縮小手段、拡大縮小処理を実現している。

【０２２８】図４２～図４６を参照して前述した例では、ポイントＡ，Ｂ，Ｃを順次検出したときにパレット１０４を表示するようにしているが、図５４に示すように、１点（ポイントＡ）の検出後、この１点の検出を維持したまま他の３点（ポイントＢ，Ｃ，Ｄ）を同時に検出したときに、パレット１０４を表示するようにしてもよい。

【０２２９】さらに、図４７～図５０を参照して前述した例では、ポイントＢにスライダーバー１０５が表示されて、ポイントＢの移動に伴ってスライダーバー１０５が移動するようにしているが、図５５に示すように、ポイントＡ，Ｂにまたがってスライダーバー１０５を表示し、ポイントＡ，Ｂの上下移動に伴ってスライダーバー１０５が移動するようにしてもよい。

【０２３０】

【発明の効果】請求項１，１２に記載の発明は、片手の手指などで画面上の複数箇所を指し示すだけの簡単な操作により、その指し示した位置の近傍等に必要な操作画像を表示することができるので、すぐ手元の画面上で操作画像を操作することができ、操作性を向上させることができる。しかも、画面上の１箇所を指し示す場合には操作画像の表示はないので、１箇所を指し示すことで行なう操作とは容易に区別することができる。

【０２３１】請求項２，１３に記載の発明は、請求項１，１２に記載の発明において、ある程度の時間間隔をあけて画面上の複数箇所を順次指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【０２３２】請求項３，１４に記載の発明は、請求項１，２，１２又は１３に記載の発明において、ある程度の距離間隔をあけて画面上の複数箇所を指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別す

ることができる。

【０２３３】請求項４，１５に記載の発明は、請求項１～３，１２～１４のいずれかの一に記載の発明において、予め登録されている種類、数又は表示位置で操作画像を表示することができる。

【０２３４】請求項５，１６に記載の発明は、請求項４，１５に記載の発明において、表示させる操作画像の詳細についてユーザの所望に登録することができるので、更に操作性を向上させることができる。

【０２３５】請求項６，１７に記載の発明は、請求項１，１２に記載の発明において、画面上の指し示し位置の移動により、ユーザは所定の操作を実行することができる。

【０２３６】請求項７，１８に記載の発明は、請求項６，１７に記載の発明において、画面上の指し示し位置の移動に応じて、操作画像を操作したように表示させることができる。

【０２３７】請求項８，１９に記載の発明は、請求項１，１２に記載の発明において、操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることができる。

【０２３８】請求項９，２０に記載の発明は、請求項１，１２に記載の発明において、画面上で複数の位置を指し示したときに直ちに操作画像を表示せず、指し示した位置を移動すると徐々に移動する扉の下から操作画像を表示するようにすることができるので、あまり見せたくない操作画像を表示する場合などに好適である。

【０２３９】請求項１０，２１に記載の発明は、請求項１～９，１２～２０のいずれかの一に記載の発明において、操作画像としてアイコン、ダイアル、スライダーバー又はパレットを用いることができる。

【０２４０】請求項１１，２２に記載の発明は、請求項１～１０，１２～２１のいずれかの一に記載の発明において、画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることができる。

【０２４１】請求項２３に記載の発明は、請求項１２～２２のいずれかの一に記載の発明と同様の効果を奏することができる。

【図面の簡単な説明】

【図１】本発明の実施の一形態である情報入出力システムを概略的に示す外観斜視図である。

【図２】情報入出力システムに内蔵される各部の電気的接続を示すブロック図である。

【図３】コンピュータに内蔵される各部の電気的接続を示すブロック図である。

【図４】第１の座標入力装置の構成を概略的に示す説明図である。

【図５】光学ユニットの構造を概略的に示す構成図である。

【図６】コントローラのブロック構成図である。

【図７】第１の座標入力装置における情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図８】ＣＣＤの検出動作を模式的に示す説明図である。

【図９】第２の座標入力装置に用いられる指示部材を示す斜視図である。

【図１０】第２の座標入力装置の情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図１１】ＣＣＤの検出動作を模式的に示す説明図である。

【図１２】第３の座標入力装置に用いられる光学ユニットを概略的に示す平面図である。

【図１３】第３の座標入力装置の情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図１４】光強度と時間との関係を示すグラフである。

【図１５】第４の座標入力装置の情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図１６】光強度と時間との関係を示すグラフである。

【図１７】第５の座標入力装置の構成を概略的に示す正面図である。

【図１８】その検出動作を説明するための概略正面図である。

【図１９】情報入出力システムを用いたアイコン操作について説明する説明図である。

【図２０】情報入出力システムが行なう処理について説明するフローチャートである。

【図２１】情報入出力システムで行なう画面操作について説明する正面図である。

【図２２】同正面図である。

【図２３】複数個の位置座標の算出についての説明図である。

【図２４】実像判定処理を含む処理の流れを概略的に示すフローチャートである。

【図２５】複数個の位置座標の算出についての説明図である。

【図２６】実像判定処理の流れを概略的に示すフローチャートである。

【図２７】座標ベクトル値算出方法を説明するためのベクトル図である。

【図２８】ベクトルテーブルを模式的に示す説明図である。

【図２９】直線を描く場合の動きを示す説明図である。

【図３０】直線方向を大きく変化させて描く場合の動きを示す説明図である。

【図３１】実像を自動的に確定することができる状態を示す説明図である。

【図３２】一の指示部材で記述している途中において、他の指示部材が情報入力領域内に挿入された状態を示す説明図である。

【図３３】情報入出力システムを用いたダイアル操作に

ついて説明する説明図である。

【図３４】ダイアル操作の処理のフローチャートである。

【図３５】ダイアル操作の際の座標検出について説明する説明図である。

【図３６】ダイアル操作の際の座標検出について説明する説明図である。

【図３７】ダイアル操作の際に行なう演算についての説明図である。

【図３８】情報入出力システムを用いた扉とパレットの操作について説明する説明図である。

【図３９】扉とパレットの操作の処理について説明するフローチャートである。

【図４０】扉とパレットの操作の際の座標検出について説明する説明図である。

【図４１】扉とパレットの操作の際に行なう演算について説明する説明図である。

【図４２】情報入出力システムを用いたパレットの操作について説明する説明図である。

【図４３】パレットの操作の処理について説明するフローチャートである。

【図４４】パレットの操作の際の座標検出について説明する説明図である。

【図４５】パレットの操作の際の座標検出について説明する説明図である。

【図４６】パレットの操作の際の座標検出について説明する説明図である。

【図４７】情報入出力システムを用いたスライダーバーの操作について説明する説明図である。

【図４８】スライダーバーの操作の処理について説明するフローチャートである。

【図４９】スライダーバーの操作の際の座標検出について説明する説明図である。

【図５０】スライダーバーの操作の際の座標検出について説明する説明図である。

【図５１】操作画像の選択について説明するフローチャートである。

【図５２】情報入出力システムを用いたオブジェクトの拡大、縮小操作について説明する説明図である。

【図５３】オブジェクトの拡大、縮小操作について説明するフローチャートである。

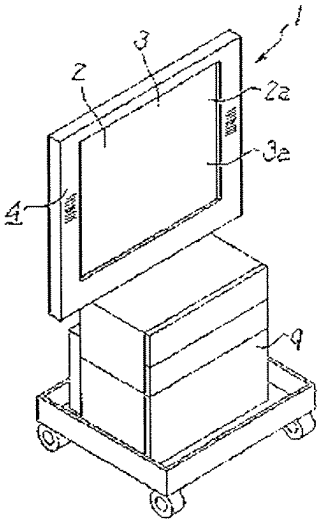
【図５４】パレットの表示について説明する説明図である。

【図５５】スライダーバーの表示について説明する説明図である。

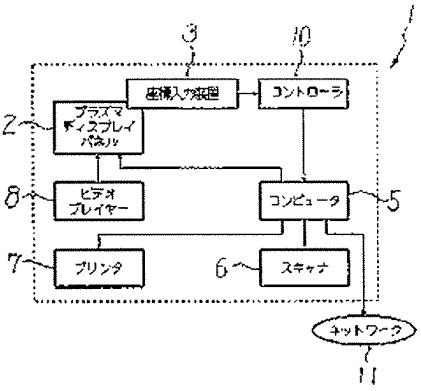
【符号の説明】

１	情報入出力システム
２	表示装置
２ａ	画面
３	座標入力装置
４	入出力装置
１７	記憶装置
２６	記憶媒体
９４	操作画像、アイコン
１０１	操作画像、ダイアル
１０２	扉
１０３	操作画像、パレット
１０４	操作画像、パレット
１０５	操作画像、スライダーバー
１０６	操作画像

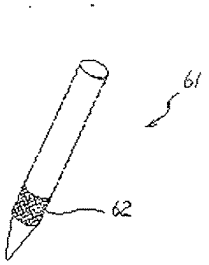
【図１】



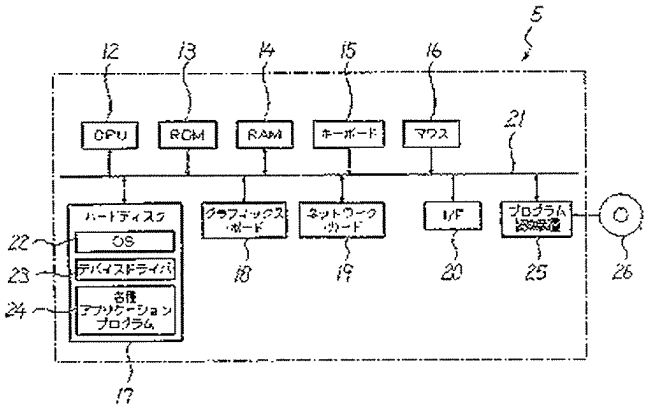
【図２】



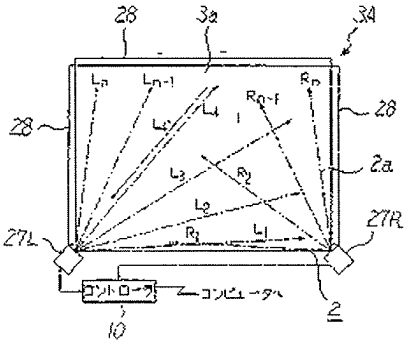
【図９】



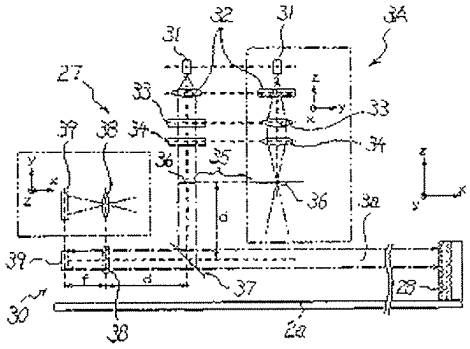
【図3】



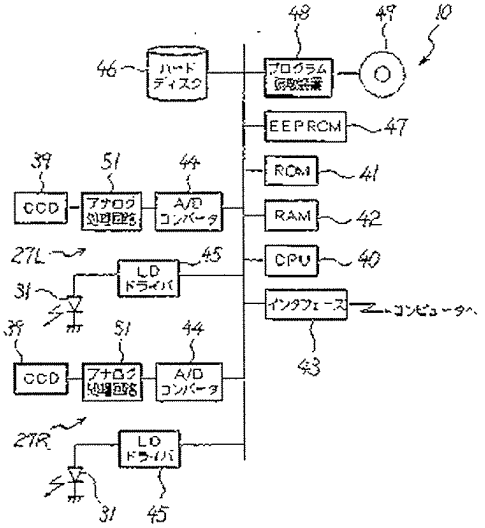
【図4】



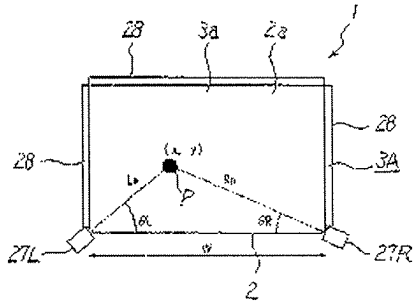
【図5】



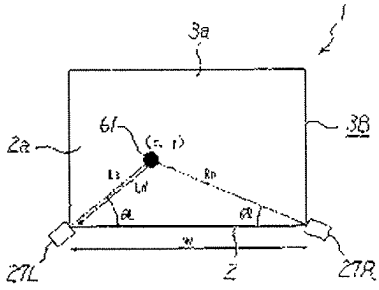
【図6】



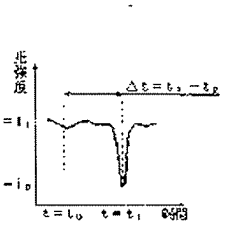
【図7】



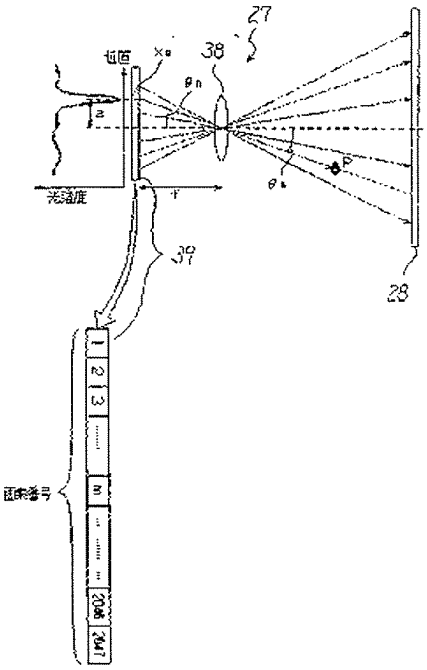
【図10】



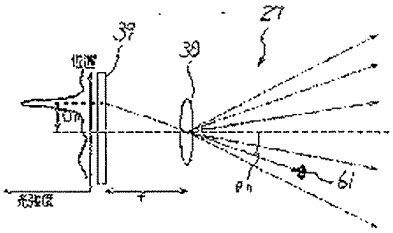
【図14】



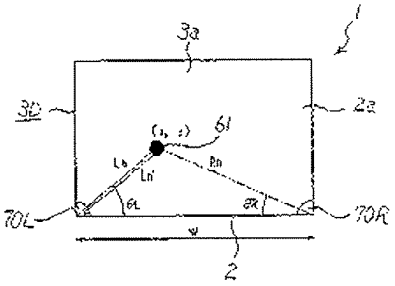
【図８】



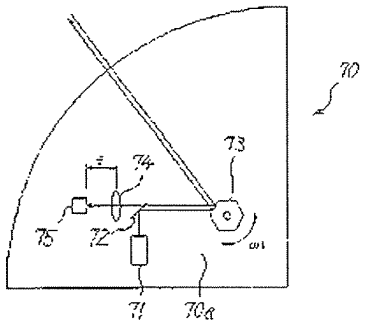
【図１１】



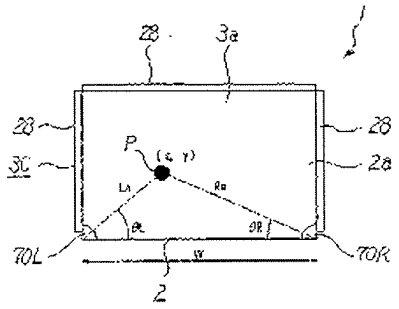
【図１５】



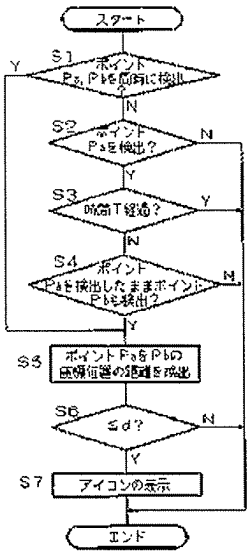
【図１２】



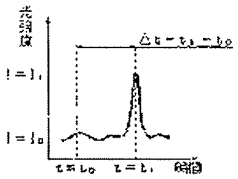
【図１３】



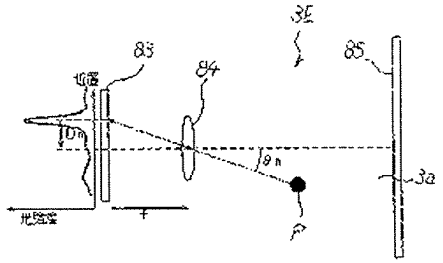
【図２０】



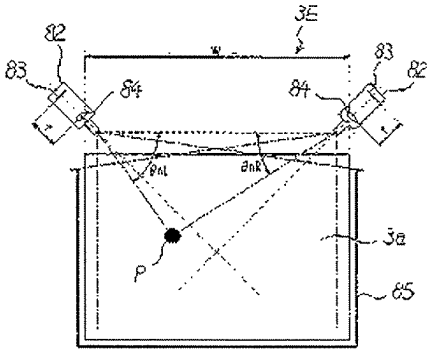
【図１６】



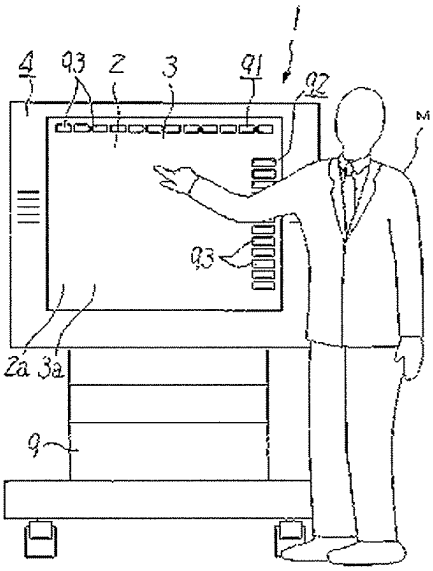
【図１８】



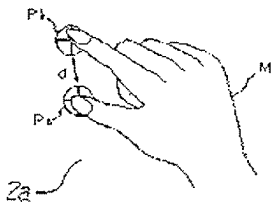
【図１７】



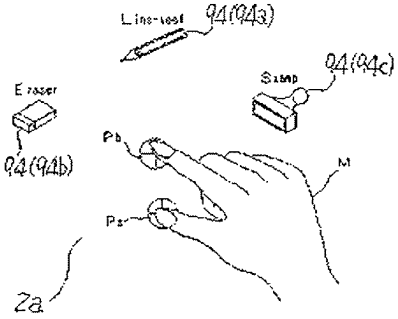
【図１９】



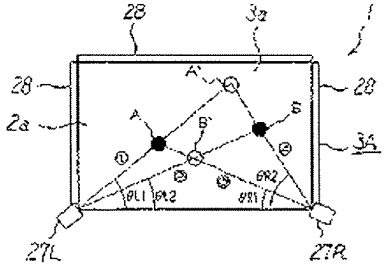
【図２１】



【図２２】



【図２３】



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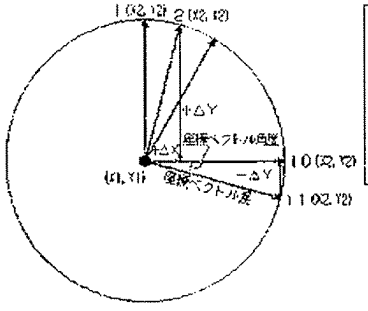

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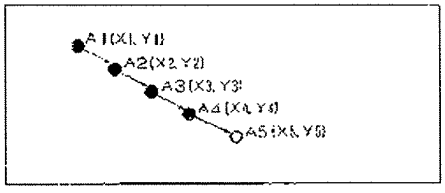

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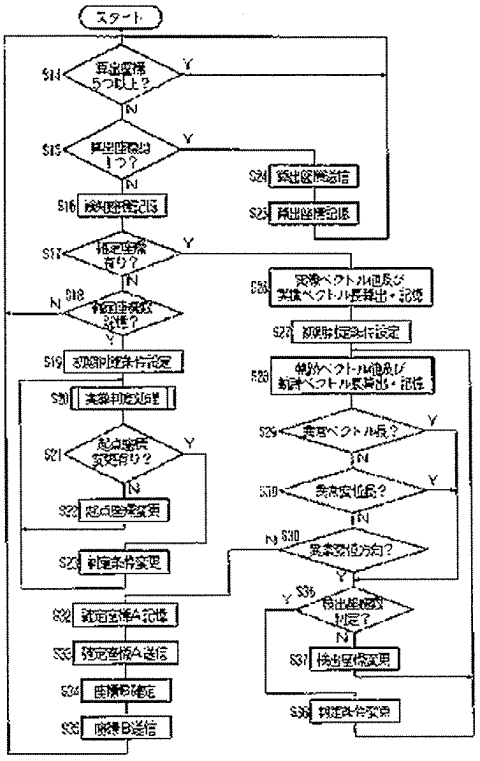

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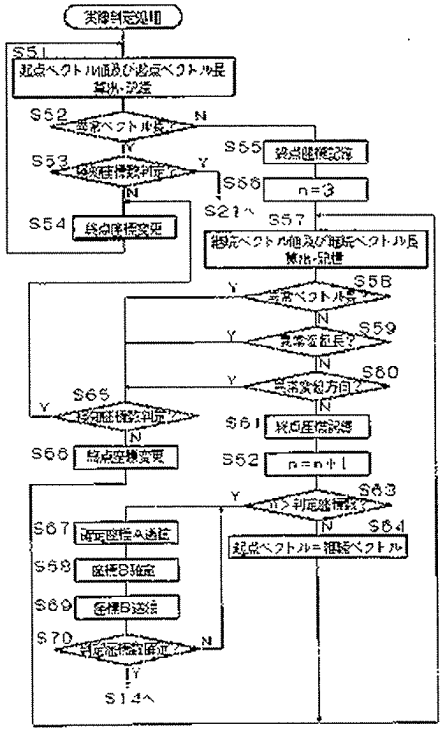

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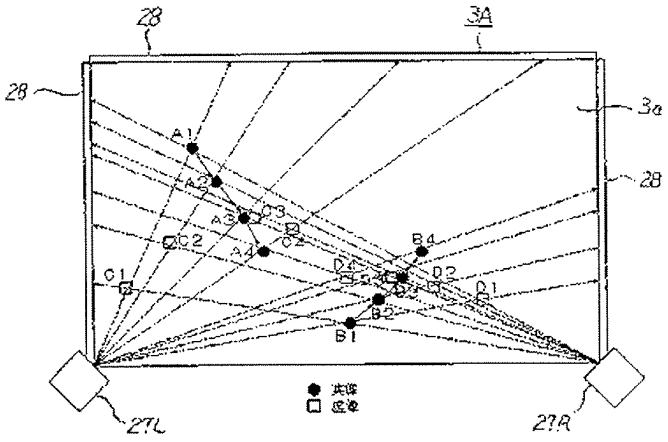

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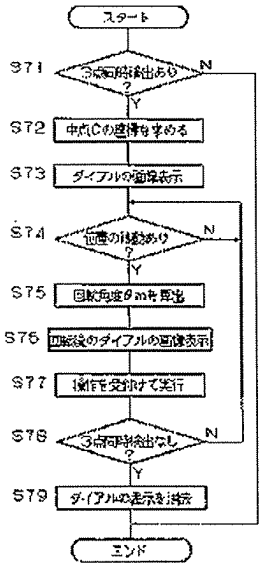
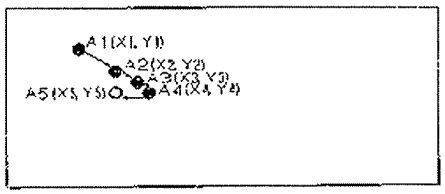


【図２８】

TB

座標ベクトル値	ΔX	ΔY	ΔY／ΔX	座標ベクトル角度
1	0	+	∞ (tan90°)	90°
2	+	+	5.671 (tan80°)	80°
3	+	+	2.747 (tan70°)	70°
4	+	+	1.732 (tan60°)	60°
5	+	+	1.192 (tan50°)	50°
6	+	+	0.839 (tan40°)	40°
7	+	+	0.577 (tan30°)	30°
8	+	+	0.364 (tan20°)	20°
9	+	+	0.176 (tan10°)	10°
10	+	0	0 (tan 0°)	0°
11	+	−	0.176 (tan10°)	10°
12	+	−	0.364 (tan20°)	20°
13	+	−	0.577 (tan30°)	30°
14	+	−	0.839 (tan40°)	40°
15	+	−	1.192 (tan50°)	50°
16	+	−	1.732 (tan60°)	60°
17	+	−	2.747 (tan70°)	70°
18	+	−	5.671 (tan80°)	80°
19	0	−	∞ (tan90°)	90°
20	−	−	5.671 (tan80°)	80°
21	−	−	2.747 (tan70°)	70°
22	−	−	1.732 (tan60°)	60°
23	−	−	1.192 (tan50°)	50°
24	−	−	0.839 (tan40°)	40°
25	−	−	0.577 (tan30°)	30°
26	−	−	0.364 (tan20°)	20°
27	−	−	0.176 (tan10°)	10°
28	−	0	0 (tan 0°)	0°
29	−	+	0.176 (tan10°)	10°
30	−	+	0.364 (tan20°)	20°
31	−	+	0.577 (tan30°)	30°
32	−	+	0.839 (tan40°)	40°
33	−	+	1.192 (tan50°)	50°
34	−	+	1.732 (tan60°)	60°
35	−	+	2.747 (tan70°)	70°
36	−	+	5.671 (tan80°)	80°

【図３０】



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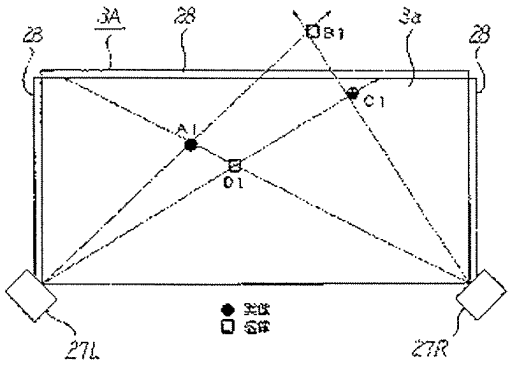

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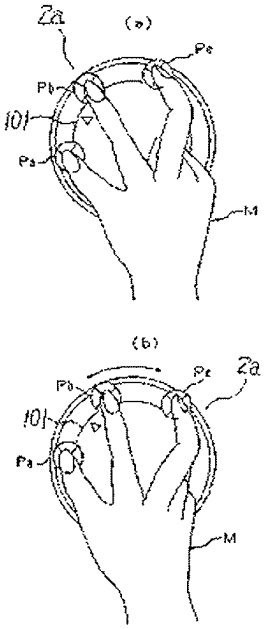

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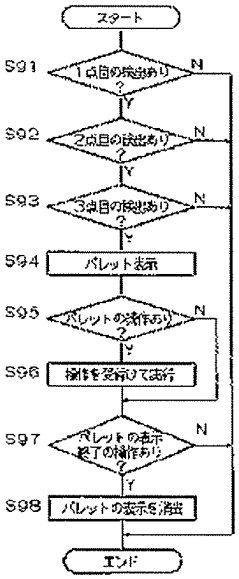

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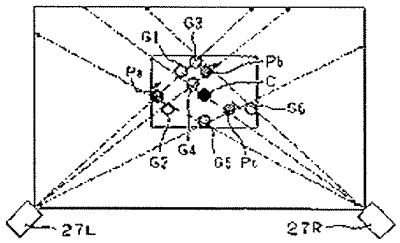

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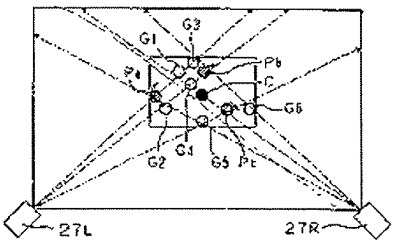

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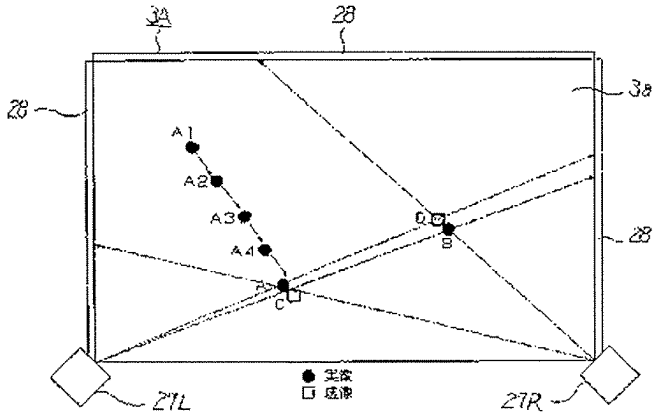

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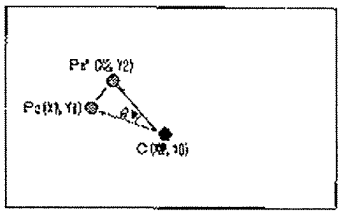

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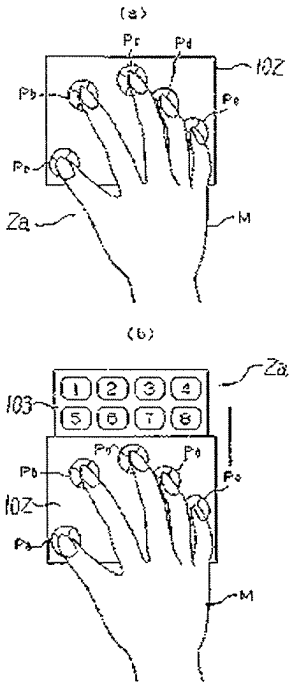

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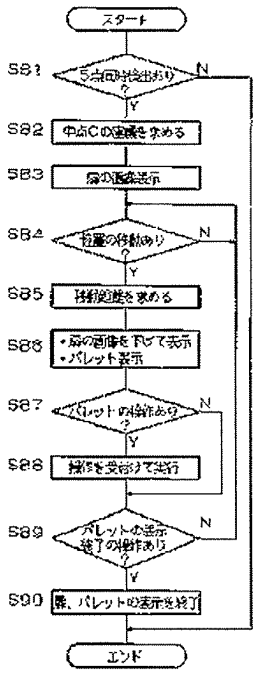

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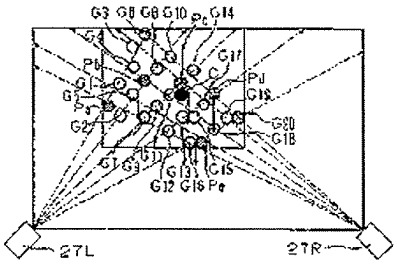

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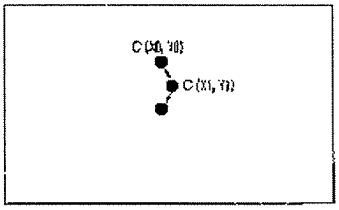

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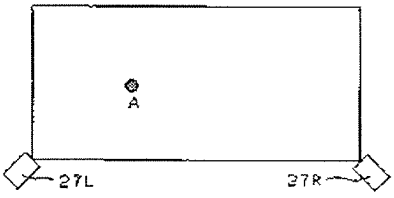

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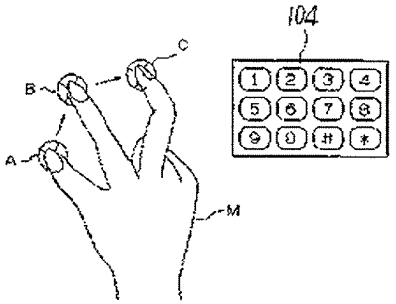

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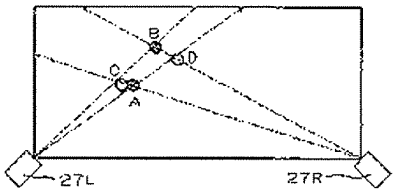

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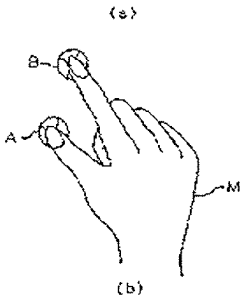

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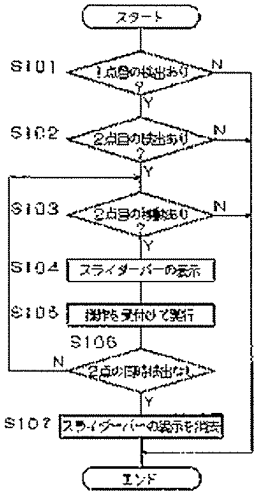

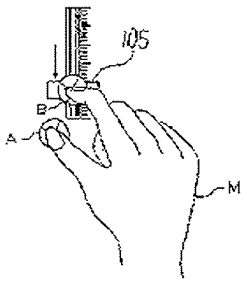

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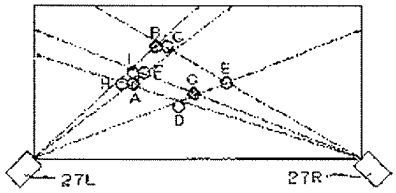

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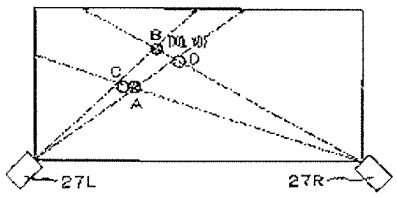

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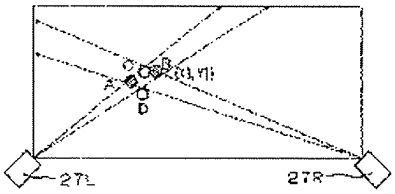

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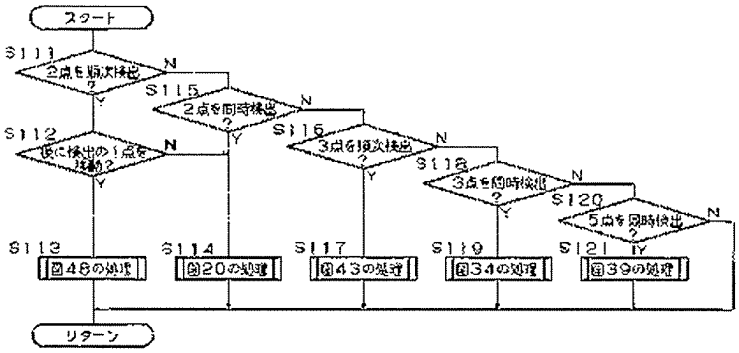

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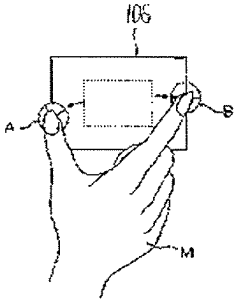

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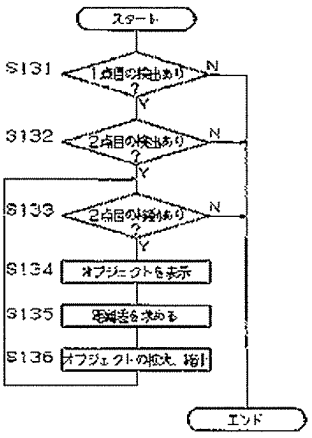

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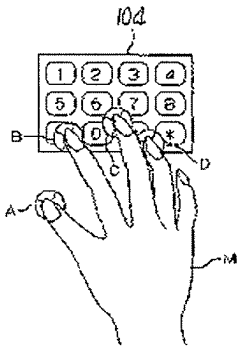

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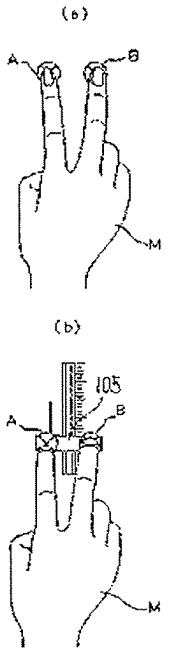

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(51)Int.Cl.'	識別記号	F I		テーマコード（参考）
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	5/36		5/36	520E

Fターム(参考)　5B087 AA09 AB02 CC26 DE03 DJ01
DJ09
5C082 AA13 AA24 BB13 BB42 BD00
CA32 CA76 CB05 DA22 DA42
DA86 MM09
5E501 AA02 AA16 BA05 CB05 EA14
FA04 FA09 FB43